

THE
MARINERS
NEW KALENDAR.

Containing

The Principles of Arithmetic and Geometry; with the Extraction of the Square and Cube Roots. Also Rules for finding the Prime, Epact, Moon's Age, Time of High-Water, with Tables for the same.

Together with

Exact Tables of the Sun's Place, Declination, and Right-Ascension. Of the Right Ascension and Declination of the Principal Fixed Stars. Of the Latitude and Longitude of Places. A large Table of Difference of Latitude and Departure, for the exact Working a Traverse.

A L S O

The Description and Use of the Sea-Quadrant, Fore-Staff and Nocturnal. The Problems of Plain-Sailing and Astronomy, wrought by the Logarithms, and by *Gunter's Scale*. A Tide Table. The Courses and Distances on the Coast of *Great Britain, Ireland, France, &c.* And the Soundings coming into the Channel. With Directions for sailing into some Principal Harbours.

Ephemerides 16

B Y

NATHANIEL COLSON, *Student in the Mathematicks*

London, Printed for *W. and J. Mount and T. Page*, on
Tower-Hill, 1748.

Where you may have all Sorts of **Mathematical Books**.

To the Ingenious *Mariner*.

I Here present thee with a *New Kalendar*, wherein I have endeavoured, not to puzzle thee with unprofitable Problems, (a Thing too much practised) but to make Things plain and practicable. Here is nothing obscure or difficult to discourage young Beginners (for whom 'tis intended) but all Things treated of with as much Plainness (both of Matter and Method) as possible; and I assure thee were I present to instruct thee, I could by no means render things more intelligible than I have here done. I have endeavoured to omit nothing that might be materially useful, having respect to the design'd bigness of the Volume. The *Contents* are as follow:

The Principles of *Arithmetic*, with which I begin, because I am sensible of the Loss some have been at, that have attempted *Navigation* before they have understood something of it; the *Extraction of the Square and Cube Roots*; In all which I have endeavoured to apply the Examples to Sea Affairs. Some necessary *Geometrical Problems*, useful in *Navigation*. Directions for finding the *Prime, Epact, Moon's Age*, and the *Time of Full Sea* (both according to the ordinary and a more accurate Way) with *Tables* for the same.

Tables of the Sun's Place and Declination, with Directions and Examples to every Case, how to use the Declination to find the Latitude: As also the necessary Tables for correcting the Declination, when the Difference of Longitude is considerable from the Meridian of *London*, for which the said Tables of Declination are calculated. A Table of the Sun's Right Ascension. A Table of the Right Ascension and Declination of some of the principal fixed Stars, with the use of the said Tables in finding the time of a Stars coming to the Meridian; as also Directions at large for Observation of any of the said Stars to find the Latitude of the Place, with Examples in each Case. The Description of the *Sea-Quadrant, For-staff or Nocturnal*. A Table of Latitude and Longitude of the principal Places on the Sea-Coast, collected from the best Information. Problems of *Plain Sailing* and *Astronomy*, (which that the *Practitioners* might learn two things at once) are wrought both by the *Logarithms*, and *Gunter's Scale*. A large and very useful Table of Difference of *Latitude* and *Departure* to every Degree and Quarter Point of the Compass: With its use in working a Traverse in order to keep a Reckoning at Sea. A *Rutter* for the Coast of *Great-Britain, France, Ireland, Spain, Portugal, &c* Shewing the Bearing and Distance from one Place to another. A Table of the *Soundings* coming into the *Channel*, giving the Depth of Water, and Quality of the Ground. Lastly, Directions for sailing into some principal Harbours. By all, or any of which, if thou art any ways profited (as I know thou mayest, if thou wantest Information in any of these Things, and dost but a little carefully animadvert upon what thou readest) I have my End. And thy kind Acceptance hereof will further oblige me,



Who am thy Friend,

Nathaniel Colson.

The Principles of Arithmetic briefly and plainly demonstrated, with the Extraction of the Square and Cube Roots.

BECAUSE of the Usefulness and Necessity of some Knowledge of *Arithmetic*, in the Art of *Navigation*, it is requisite to begin with that, without which no orderly Procedure can be made; and first of

Numeration.

Numeration is that part of *Arithmetic*, whereby one may rightly express the Value of any Number proposed.

All Numbers are expressed by these Characters following.

1, 2, 3, 4, 5, 6, 7, 8, 9, 0,
One, Two, Three, Four, Five, Six, Seven, Eight, Nine, Cypher,

Altho' Cyphers signify nothing by themselves, yet being put before (or to the Right Hand of) other Figures, they increase their Value as much as if they were all Figures, as may plainly be seen in the Table following.

1	Units	1
12	Tens	10
123	Hundreds	100
1234	Thousands	1000
12345	X Thousands	10000
123456	C Thousands	100000
1234567	Millions	1000000
12345678	X Millions	10000000
123456789	C Millions	100000000

Figures have their Value according to the Places they are set in, as 1 in the first Place, or Place of *Units*, is *One*; in the second Place *Ten*; in the third Place *One Hundred*; in the fourth Place *One Thousand*; in the fifth Place *Ten Thousand*, &c.

The Table directs how properly to express any given Number; As 123, which Number consisting of three Places, is thus numbred, *One Hundred Twenty Three*; this Number 123456, consisting of six Places, is thus expressed, *One Hundred, Twenty Three Thousand, Four Hundred fifty six*; and this Number 123456789, consisting of nine Places, is thus numbred, *One Hundred twenty three Millions, Four Hundred Fifty six Thousand, Seven Hundred Eighty Nine*.

Addition

Addition is that which of several Sums makes but one Sum.

Example. Suppose four Men (A. B. C. D.) owe me several Sums of Money, I would know how much is due to me in the whole: I begin at the first Row towards the Right Hand and say, 3 and 6 is 9 and 2 is 11, and 4 is 15; setting down the 5 under the Row added up; then I carry the 1 ten to the next Row, saying 1 and 4 is 5, and 5 is 10, and 3 is 13, and 6 is 19; set down 9 under the Row added up, and carry one to the next row, saying, 1 and 8 is 9, and 1 is 10, and 4 is 14, and 5 is 19; set down 9 and carry 1, which 1 and 1 is 2, and 3 is 5, and 5 is 10, and 3 is 13, which because this is the first row, I set down: So that by this *Addition*, the whole Debt is found to be *Thirteen Thousand, Nine Hundred, Ninety five Pounds*.

Characters used in Arithmetick.

Examp. 2. Suppose I have several Creditors to whom I owe several Sums of Money, I desire to know the whole.

Therefore begin again (as always in *Addition*) at the Right-hand, I say 11 and 10 is 21, and 4 is 25, and 6 is 31; now considering how many Shillings there are in 31d. I find 2s. and 7d. wherefore I set down the odd 7d. under the row of Pence, and carry the 2s. to the next row being Shillings, saying 2 and 4 is 6, and 8 is 14, and 9 is 23, and 11 is 34, that is 1l. 14s. set down 14s. and carry the 1l. to the next row, saying, 1 and 3 is 4, and 6 is 10, and 5 is 15, and 3 is 18; set down 8 and carry 1; then 1 and 3 is 4, and 5 is 9, and 3 is 12; set down 2 and carry 1: Lastly, 1 and 1 is 2; so that by this *Addition* the whole Debt is, *Two Hundred Twenty Eight Pounds, Fourteen Shillings and Seven Pence*.

Examp. 3. Suppose at Sea, keeping my Reckoning in Degrees and Minutes, having six Days Difference of Longitude. I would know how much the whole is.

Say 13 and 2 is 15, and 9 is 24, and 56 is 80 and 6 is 86; now 60 Minutes making a Degree, set down the odd 26 Minutes under the row of Minutes, and carry the 1 Degree to the next row, being Degrees; saying 1 that I carry'd and 1 is 2, and 1 is 3, and 2 is 5, and 1 is 6, and 1 is 7; so that the whole Difference of Longitude made these 6 Days, is 7 Degrees and 26 Minutes.

l. } Pounds.
s. } Shillings
d. } Pence.
° } Degrees.
' } Minutes.
" } Seconds.

l.	s.	d.
33	11	06
55	09	04
36	08	10
103	04	11
228	14	07

°	'
1	Day 1 06
2	— 0 56
3	— 1 09
4	— 2 00
5	— 1 02
6	— 1 13
0	7 26

Subtract.

SUBTRACTION.

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Subtraction is the taking of a less Sum out of a greater, and finding the Remainder

	l.	s.	d.
<i>Example.</i> Suppose a Man oweth me —————	376	13	06
And hath paid me —————	211	05	08
I desire to know what remains unpaid, which is ———	105	07	10

To work this I say, 8 from 6 I cannot, but considering there is 12 Pence contained in a Shilling, I add, 12 to 6; and say 8 from 18, and there remains 10, which set down under the Pence; and then having borrowed 1 I go to the next Row, and say, 1 that I borrowed and 5 is 6, which take out of 13, there remains 7; then proceeding to the Pounds, I say, 1 from 6 there remains 5, and 1 from 7 there remains 6; and lastly, 2 from 3, there remains 1: so there remains due of the said Debt, *One Hundred Sixty Five Pounds, Seven Shillings, Ten Pence.*

Example 2. Suppose the Distance between two Places to be 1000 Miles, and that I have sailed 396, and desire to know how many Miles I have to Sail.

Therefore placing 396, under the 1000, I say, 6 from 0 I cannot, but 6 from 10, there remains 4; proceeding to the next Figure I Miles, say, 1 that I borrowed and 9 is 10, from 0 I cannot, but 10 from 1000 10 there remains 0: Again, 1 that I borrowed and 3 is 4, from 396 0 I cannot; but 4 from 10, there remains 6: Lastly, 1 that I borrowed from 1, there remains 0: So there remains 604 Miles.

Example 3. Suppose one Place in the Latitude of 51 Deg. 32 Min. and another in the Latitude of 42 Deg. 10 Min. I would know the Difference of Latitude between them.

To do which, subtract the less Latitude out of the greater thus; the lesser being placed undermost, say, 10 from 32, there remains 22, which Place under the Minutes; then for the Degrees, 2 from 1 I cannot, but 2 from 11, there remains 9; then 1 that I borrowed, and 4 is 5, 5 from 5 there remains 0.

So the Difference of Latitude is 9 Deg. 22 Min.

Multiplication.

Multiplication is that which serves instead of many Additions, by which any Number of a greater Denomination is brought into a less, as Pounds into Shillings, and Shillings into Pence, and Pence into Farthings, Degrees into Minutes, Minutes into Seconds, and the like; which is done by multiplying the Number of the greater Denomination, by that Number of the lesser which is contained in one of the greater, as the multiplying any Number of Pounds by 20 (the Number of Shillings contain'd in a Pound) brings it into Shillings, and so of the rest.

Multiplication consists of Three Parts.

1. The Multiplicand, or Number to be multiplied.
2. Multiplier, or Number by which to multiply.
3. The Product made by the Multiplication.

For the Learner's more ready Procedure herein, it is necessary to insert the Table which is first to be committed to Memory. The

MULTIPLICATION.

The Multiplication TABLE.

2 times	2	is	4	4 times	4	is	16	7 times	7	is	49
	3		6		5		20		8		56
	4		8		6		24		9		63
	5		10		7		28				
	6		12		8		32				
	7		14		9		36				
	8		16								
3 times	3	is	9	5 times	5	is	25	8 times	8	is	64
	4		12		6		30		9		72
	5		15		7		35				
	6		18		8		40				
	7		21		9		45				
	8		24								
	9		27								
6 times	6	is	36	10 times	10	is	100				
	7		42								
	8		48								
	9		54								
	0										

Example 1. I demand how many Shillings there are in 5648 *l.*
 To Answer this, multiply the given Number of Pounds by 20,
 Thus; The first being 0 Cypher, set down 0 underneath the first
 Figure; and then proceed to the next Figure, and say, 2 times 8
 is 16; set down 6 under the second Figure and carry 1; then
 2 times 4 is 8, and 1 that I carried makes 9; then 2 times 6 is
 12, set down 2, and carry 1; lastly, 2 times 5 is 10, and 1 that I carried
 makes 11. So that 5648 *l.* multiply'd by 20, makes 112960 Shillings.

Example 2. In 276 Degrees how many Minutes?

First set down _____ 276
 Then (because 60 Minutes make a Degree) multiply by _____ 60
 The Product is _____ 16560
 So that I find 276 Degrees multiplied by 60, makes 16560 Minutes.

Example 3. Multiply _____ 8765437
 By _____ 32
 Product _____ 280493984

Multiply _____ 47632867
 By _____ 4352
 _____ 95265734
 _____ 238164335
 _____ 142898601
 _____ 190531468
 _____ 207298237184

DIVISION.

Division is that which serves in the Room of many Subtractions, and is
 useful in reducing all Numbers of a lesser Denomination into a greater,
 as Minutes into Degrees, Farthings into Pence, Pence into Shillings, and
 Shillings into Pounds. It consists of Three Parts, (*vis.*) Dividend or the
 Num.

Division.

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Number to be divided ; Divisor, or the Number to divide by ; and the Quotient ; also if any Number remain, it is called the Remainder.

Examp. 1. To divide 7834 by 23: first say, how many times 2 in 7; Or, how often 23 in 78, the Answer will be 3 times, which place in the Quotient; then multiply the Divisor 23 by 3, the Figure placed in the Quotient, saying, 3 times 3 is 9, and 3 times 2 is 6, place these under the two first Figures of the

Divisor.	Dividend.	Quotient.
23	7834	(340
)	69	

	93
	92

14 Remainder.

Dividend, and draw a Line; subtracting 69 from 78, there rests 9, which set underneath, and place a Point under 3, to shew that it is brought down; place it to the 9, then proceed, saying, how many times 23 in 93, or how many times 2 in 9, which will be 4 times; place 4 in the Quotient, by which multiply the Divisor: Again, placing the Product which is 92 under 93, draw a Line, and subtract therefrom, the Remainder 1 put under the Line, and set down 4 the last Figure in the Dividend, putting a Point under it, and place it to the remaining 1; then because there remains but 14; being less than the Divisor 23, and so cannot be taken out of it, place a Cypher in the Quotient, and the Work is finished.

Examp. 2. In 360 Minutes how many Degrees? Here I divide by 60, because 60 Minutes make a Degree, and because the last Figure of the Divisor is a Cypher, I cut it off, and with it the last Figure of the Dividend, which is here

Divisor.	Dividend.	Quotient.
60	360	(6
)	36	

00

also a Cypher, and divide 36 by 6, (which is the same thing as to divide 360 by 60) but because 6 cannot be taken out of 3, therefore I say, how many times 6 in 36? The Answer is 6 times: which I place in the Quotient, and proceed to multiply the Divisor 6, by the 6 placed in the Quotient, which produceth 36, which subtracted leaves 0, so that by this Work it appears, that in 360 Minutes there are 6 Degrees just.

Example 3. A Ship taken by 253 Men, is valued at 59875*l*. I demand each Man's Share, being equally divided.

Divisor.	Dividend.	Quotient.
253	59875	(236
)	506	

	927
	759
	1685
	1518

167 Remains

	253
	236
	1518
	759
	506
	167

Proof 59875

First, say, how many times 2 in 5? The Answer is two times, which place in the Quotient; then multiply the Divisor 253 by 2, the Figure placed

placed in the Quotient, saying 2 times 3 is 6, 2 times 5 is 10, set down 0, and carry 1; 2 times 2 is 4, and 1 is 5, which set down under the 3 first Figures of the *Dividend*, from whence being subtracted, set the Remainder underneath, which will be 92, then take down 7, making a Point underneath, and set it after 92, the Remainder; then say how often 2 in 9, Answer 3 times (for 4 will prove too many.) Then multiply the *Divisor* 253, as before, by 3, the Figure last placed in the Quotient, and the Product will be 759, which being subtracted from the Figures above, the Remainder will be 168, then take down 5, and point it as before, setting it after 168, the last Remainder: And again, ask the Question, how often 2 is contained in 16? Answer 6 times; by which 6, when set in the Quotient, multiply the *Divisor* 253; and the Product is 1518, which place under the last *Dividend*, and subtract therefrom, there will remain 167. So there being no more Figures to bring down, the Work is finish'd, each Man's Share being 236*l.* and 167*l.* over, which is to be divided among them; which may easily be done by multiplying 167 by 240, and dividing the Product by 253, gives each Man's Share in Pence. The Proof is by multiplying 253 the *Divisor* by 236 the Quotient; then taking in 167 the Remainder, under the 3 last Figures, the Product will make the same with the *Dividend*, as you see in the Operation.

The Rule of THREE,

IS that, which having three Numbers given, a fourth Number is found in Proportion thereunto; which is done by multiplying the 2d and 3d Numbers together, and dividing that Product by the first, and the Quotient of the said Division is the Answer to the Question.

Example 1. If in 24 Hours a Ship sails 130 Miles; how many Miles will she sail with the same Gale in 192 Hours or eight Days?

Hours	Miles	Hours
24	130	192
		130
		5760
24) 24960	(1040 Miles in 192	192
24	Hours	24960
96		
96		
00		

Here 24 is the first Number, 130 the second, 192 the third; wherefore according to the Rule, I multiply 130 and 192 the second and third Numbers together, and divide the Product thereof 24960, by 24 the first Number, which gives in the Quotient 1040 Miles, which is the Way the Ship will make in 192 Hours the Time proposed.

Example 2. If 1*lb.* of Tobacco cost 6*d.* what will 112*lb.* cost?

$$\begin{array}{r}
 112 \\
 6 \\
 \hline
 12)672 \text{ Pence (or 56 Shillings.)}
 \end{array}$$

Here

The Rule of Three.

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Here the first Number being an Unit, which neither multiplies nor divides, it saves the Labour of Division, and the Answer is 672*d*. (for the Answer will be of the same Name with the second Number) which divided by 12 to bring them into Shillings, gives the Quotient 56*s*. which is the Price of 112*lb*. as required.

Example 3. If a Staff of 3 Yards long give a Shadow of 2 Yards: How high is that Castle whose Shadow is 100 Foot?

Which Question, for the more ready Solution, state thus:

If 6 Foot (which is 2 Yards) give 9 Foot, what will 100 Foot give?

By the Operation it appears, the said Castle must be 150 Foot high

$$\begin{array}{r} 9 \\ 6)900(150 \text{ Foot} \\ \underline{6} \\ 30 \\ \underline{30} \\ 00 \end{array}$$

Example 4. If 564*l*. 12*s*. 6*d*. is to be divided between 165 Men, how much is one Man's Share?

First, reduce it all into Pence, by multiplying 564 by 20 (the Shillings in one Pound) taking in the 12 Shillings, as you are taught in Multiplication, and the Sum 11292, multiply by 12 (the Pence in one Shilling) and add the 6 Pence, the Sum 135510 is the Pence in 564*l*. 12*s*. 6*d*. Then say,

If 165 Men have 135510 Pence, how many shall one Man have? And here you should multiply 135510 by the last Number, but in this Case it is 1, which will neither multiply nor divide, therefore you only divide 135510 the Sum of Pence, by 165 the Number of Men, and the Quotient 821 is the Pence for each Man's Share, which divided by 12 (the Pence in one Shilling) gives 68 Shillings, and the 5 remaining are 5 Pence to each Man's Share.

Note, The 45 remaining of the first Division is only $\frac{45}{12}$ of one Penny, which is little more than a Farthing.

The Operation follows.

$$\begin{array}{r} 564 \text{ l. } 12 \text{ s } 6 \text{ d} \\ \underline{20} \\ 11292 \\ \underline{12} \\ 22590 \\ 11292 \\ \hline 165)135510(821 \text{ Pence} \\ \underline{1320} \\ 351 \\ \underline{330} \\ 210 \\ \underline{165} \\ 45 \end{array}$$

$$\begin{array}{r} 12)821(68 \text{ Shillings, equal} \\ \underline{72} \quad \text{to } 3 \text{ l. } 8 \text{ s. } 5 \text{ d.} \\ 101 \\ \underline{96} \\ 5 \text{ Pence.} \end{array}$$

The Extraction of the Square Root.

Note. That in the *Rule of Three*, the first and third Number must be both of one Denomination, and the second must be brought into the lowest Value expressed therein; as in the foregoing Example, I work not the Question as it was first stated, but transposing the Numbers, I put the Denomination of Men first and last, and the Money in the midst, to answer to that part of the Rule, which requires the first and third Numbers to be both of one Name. The Answer thereof in the preceding Question, as by the Operation appears, is 821 Pence: which reduced into Shillings, is 68s. and 5d. or 3l. 8s. 5d. one Man's Share, as was required.

The next thing I shall briefly treat of, is *The Extraction of the Square and Cube Roots*, as also somewhat of their Use.

The Extraction of the Square Root.

Ex. 1. **T**O extract the Square Root of 7056 proceed thus: First point the given Number (that is, put a prick over every other Figure beginning at the first Figure at the Right-hand, and note by the way, that so many Points as the said Number admits over it, of so many

Figures consists the Root of the said Number, then proceed, seeking the greatest Square Number (which is a Number multiplied by itself) in the first Point towards the Left-hand (70) which is 64 constituted of 8 multiplied into itself; for 8 times 8 is 64. The Root of the Square Number which is 8, place in the Quotient, and subscribe the Square Number (64) under the said first Point, subtracting it therefrom, and setting down the Remainder (6) underneath: To this Remainder bring down the next Point (56) then drawing a crooked Line, on the Left-hand of the Dividend (656) double the Quotient, and place it (*viz.* 16.) therein, calling it the Divisor, seek how often the Divisor is contained in all the Figures of the Dividend, save the last to the Right-hand: (*viz.*) How many times 16 in 65? The Answer is 4 times, which place in the Quotient, and also on the Right-hand of the Divisor (16) then multiply the Divisor (164) by the 4 last placed in the Quotient, and put the Product, which is 656, under the Dividend, subtracting it therefrom; which done, nothing remains: So that the Square Root of 7056 is 84.

$$\begin{array}{r}
 7056(84 \text{ Root} \\
 64 \\
 \hline
 164)656 \text{ Divisor} \\
 656 \\
 \hline
 000
 \end{array}$$

The Square Root is applied to Navigation, as follows.

Any two sides of a Right-angled Plain Triangle being given, the third is found by the Extraction of the Square Root.

Example 2. Suppose a Ship to have made 87 Miles Difference of Latitude, and 71 Miles Departure, and the Distance to be required, the said Distance is found by the Extraction of the Square Root, as follows.

The Rule. Square the Difference of Latitude and Departure severally (that is, multiply each by it self) and from the Sum of both the Squares added together, extract the Square Root, which will be the Distance required.

Example

The Extraction of the Square Root.

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Example.

Difference of Lat. 87. The Departure 71. Square Diff. Lat. — 7569
 Multiplied by itself 87. Multiplied by itself 71. Square Departure — 5041
 Their Sum 12610

609
 696
 The Square — 7569

71
 497
 The Square 5041

12610(112, the Distance req.

By the Operation it appears, that the Distance, omitting the Fraction, is 112 Miles.

1
 21)26
 21
 222) 510
 444
 66

Examp. 2. Suppose a Ship's Distance to be 111 Miles, her Departure 57 Miles, and the Difference of Latitude to be required; the said Difference of Latitude is found, by the Extraction of the Square Root, as follows.

The Rule. From the Square of the Distance subtract the Square of the Departure, and the Square Root of the Remainder will be the Difference of Latitude required,

Example. The Distance — 111 — The Departure — 57
 Multiplied by it self — 111 — Multiplied by it self — 57
 111
 111
 111
 399
 285
 Sq. of Departure — 3249

Square of the Distance 12321
 Square of Dep. subtract 3249
 Remains 9072

9072(95 Diff. Lat. required.
 81
 185)972
 925

The Difference of Latitude, as by the Operation appears, is 95 Miles, omitting Fractions.

If the Departure be required, the Rule is, from the Square of the Distance, subtract the Square of the Difference of Latitude, and the Square Root of the Remainder is the Departure required. The Operation for Brevity-sake is omitted.

Having proceeded thus far in shewing the Practitioner how to find the Distance, Difference of Latitude and Departure (any two of them being given without Trigonometry, I shall shew the manner of finding the Course exact enough for common Use, without the said Operation, which is done as follows :

The Proportion to find the Course. As the Sum of the Hypotenuse (or Distance) and half the greater of the other two Legs (viz.) if the Difference of

14 *The Use of the Extraction of the Square Root.*

of Latitude be most, half that, but if the Departure be most, half that : I say ; As the Sum of these two, is in Proportion to the lesser (or remaining) Leg ; so is 86, to the Angle (in Degrees) opposite to the less Leg ; which is the Course, when the Departure is less than the Difference of Latitude, otherwise 'tis the Complement of the Course.

Examp. Admit a Ship's Distance to be 110 ; the Difference of Latitude to be 88, and the Departure 66, and the Course required.

First, add the Distance, and half the greater Leg into one Sum.

The Distance is _____ 110

Half the greater Leg (88) is _____ 44

The Sum _____ 154

Having thus done, say by the *Rule of Three*.

As the said Sum 154 is to 66 the lesser Leg, so is 86 to the Course.

To bring out the odd Minutes, multiply the Remainder of the Division 132 by 60, (the Number of Minutes contained in a Degree) and divide the Product by the *Divisor* (154) and the Quotient of the said *Division* gives for the Answer 51 Minutes ; So that the Course required is 36 deg. 51 minutes.

$$\begin{array}{r}
 66 \\
 \hline
 516 \\
 516 \\
 \hline
 154 \overline{) 5676} (36 \text{ deg. } 51 \text{ min.} \\
 \underline{462} 132 \\
 \underline{1056} 60 \\
 \underline{924} 154 \overline{) 7920} (51 \\
 \underline{132} 770 \\
 \hline
 220
 \end{array}$$

Example 3. Extraction of the Square Root. Suppose a Rope of 5 Inches Compass, and another Rope of double the Strength is required. The Dimensions of the said required Rope are found by the *Extraction of the Square Root* : For should it be supposed that at Rope of 10 Inches Compass, is but double the Strength of a Rope of 5 Inches ; upon Proof it is manifestly false, for the said Rope of 10 Inches is 4 times the Strength of that of 5.

The Rule. Take the Compass of the given Rope (*viz.* 5.) and multiply that by itself ; which Product (because the other Rope is to be twice as strong) multiply by 2, and the Square Root of the Product is the Compass of the Rope required. *Inc.*

Example. The given Rope's Compass 5 Inches, Extract the Root 50(7

Multiplied by itself _____ 5

The Square _____ 25 49

Multiplied by _____ 2 1

50

So by this Operation it appears that a Rope must be 7 Inches and a little better, to be twice the Strength of the given Rope of 5 Inches Compass.

If it's desired to know the Weight of one Rope by another, 'tis as follows.

The Proportion is, As the Square of the Compass of the one Rope is to the square of the Compass of the other ; so is the Weight of the one to the Weight of the other, Length for Length : *Ex.* Suppose a Cable of 10 Inches to weigh 25 Hundred, and the Weight of a Cable of 8 Inches required. Say, as 100 (the Square of 10) is to 64 the Square of 8 : so is 25C. the Weight

Extraction of the Cube Root.

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Extraction of the Cube Root.

I shall first, as necessary, insert a Table of the Cubes of the Nine Digits, which ought to be committed to Memory.

Cubes of the Nine Digits	1 ——— 001	4 ——— 064	7 ——— 343
	2 ——— 008	5 ——— 125	8 ——— 512
	3 ——— 027	6 ——— 216	9 ——— 729

Example 1. Extract the Cube Root of 12167

First, Point the given Number (*i. e.*) put a Prick over every third Figure (beginning at the Right Hand) then seek the greatest Cube in the first Point, (*viz.* 12) which is 8, the Cube Root whereof, (which is 2) place in the Quotient; subtract the Cube (8) from the first Point (12) place the Remainder underneath; to this Remainder bring down the next Point (167) and call this the Resolvend, then draw a Line underneath it, then square the Quotient 2, which is 4; multiply the said Square (4) by 300, which makes 1200; place this under the Resolvend, and call it the Triple

12167 (23 Root
8
4167 Resolvend
1200 Triple Square
60 Triple Quotient
1260 Divisor
3600
540
27
4167
000

Square. Again, multiply the Quotient (2) by 30, which makes 60; place this under the Triple Square, and call it the Triple Quotient; add these two, (*viz.*) Triple Square and Triple Quotient into one Sum, and call it the *Divisor*; seek how often this *Divisor* is contained in the Resolvend, which is three Times; which 3 placed in the Quotient, multiply the Triple Square by the Figure 3 last placed in the Quotient, and subscribe the Product underneath the *Divisor*; square the said Figure (3) last placed in the Quotient, and thereby multiply the Triple Quotient, and place it underneath the last Product: Cube the Figure (3) last placed in the Quotient, and place it under the preceding Products. Lastly, add these three Products into one Sum, subtracting the said Sum from the Resolvend, subscribe the Remainder; to which Remainder had there been any more Figures, the next Point must have been brought down, and the preceding Work repeated from the Squaring of the Quotient, until all the Figures are so brought down; but in this Example there being no more Figures, the Work is done, and by the Operation the Cube Root of 12167 appears to be 23, nothing remaining.

Example 2. applied. Suppose a Ship of 300 Tun, 75 Foot by the Keel, 29 Foot and a half at the Beam, and 14 Foot deep in the Hold; another Ship is desired of the same Mould and Shape of 500 Tuns; the several Dimensions of the Ship are found by the Extraction of the Cube Root.

Example. Beginning with the Keel. First, Cube the Length of the given Keel, which is done by multiplying it into itself, and then multiplying the Product by it again.

Then

Then say by the Rule of Three : As 300 Tun the one Ship's Burthen ; to 500 Tun the other Ship's Burthen ; so is 421875 the Cube of one Ship's Keel's Length, to the Cube of the other Keel's Length. Which being wrought by the Rule of Three, gives 703125 : From which extract the Cube Root, and that will be the Length of the Keel required.

In this Extraction 3 Cyphers are added to bring out the Fraction, the Operation therewith being the same as if there had been more Figures in the proposed Number ; the Operation gives for the Length of the Keel required 88 Foot $\frac{2}{3}$ Parts.

Thus, having found one of the Dimensions, the rest may be found without the Extraction of the Root, by the Rule of Three.

Thus, suppose the next thing I would find be her Breadth by the Beam, say, as the Length of the one Ship's Keel 75, is to the Length of the other 89 *feres* : So 29 $\frac{1}{2}$ Foot, the Breadth of the one Ship by the Beam, to the Breadth of the other, which by the Rule of Three, gives 35 Foot $\frac{3}{4}$. So you may find the Depth in the Hold, &c.

Example 3. Suppose an Iron Shot 4 Inches Diameter to weigh 9lb. and the Diameter of a Shot of any other weight, suppose of 72lb. required. This is also done by the Extraction of the Cube Root, as follows :

First, say, by the Rule of Three,

As 9lb. the weight of one Shot, to 72lb. the Weight of the other ; so is 64 the Cube of the one Shot's Diameter, to the Cube of the other Shot's Diameter ; which by the Operation is 512, the Cube Root of which is 8, the Diameter of the Shot required.

75 given Keel
75
375
525
5625
75
28125
39375
421875 Cube given Keel
703125 (88 $\frac{2}{3}$ Root
512
101125 Resolvend
1900 Triple Square
240 Triple Quotient
19440 Divisor
153600
15360
512
169472
21653000 Resolvend
2323200 Triple Square
2640 Tr Quotient
2325840 Divisor
20908800
213840
729
21123369
529631 Remainder

But if it were required to find the Weight of a Shot by the Diameter, 'tis done thus, by the Rule of Three.

As the Cube of one Shot's Diameter, to the Cube of the other : So is the Weight of the one Shot, to the Weight of the other required.

And thus much for the *Aritbmetic Part* of this Treatise.

Some

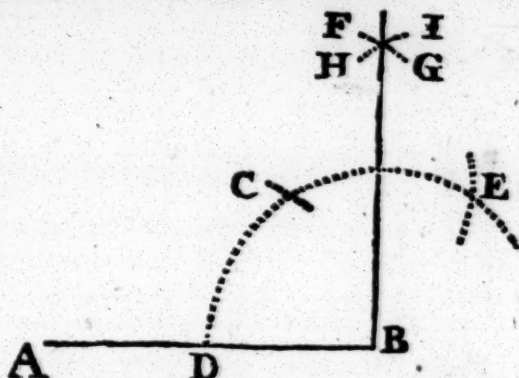
Prob. I. To raise a Perpendicular from any Point proposed, in a given Right Line.

LET the Line given be AB, and the Perpendicular to be raised from the Point C; to do which set off the two equal Distances CA and CB. Then the Compasses being opened to any convenient Distance bigger than AC or CB, with one Foot of the Compasses in the Point A, describe the Arch DE; then with the same Extent, and one Foot in the Point B, describe the Arch FG, then draw the Perpendicular from the Point C, thro' the Intersection, (or cutting) of the two Arches FG and DE, which was required.



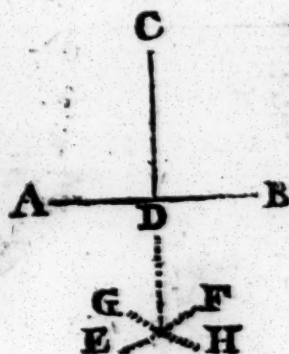
Prob. II. To raise a Perpendicular on the End of a Line.

Let the Line given be AB, the Perpendicular to be raised from the Point B; to do which, with one Foot of the Compasses at B, with any convenient Distance, as BD, sweep an Arch; then with the same Extent, one Foot of the Compasses being in the Point D, mark the said Arch at the Point C, and one Foot being at C, mark it at E, then with the same Distance, one Foot of the Compasses being in the Point C, describe the Arch FG; and placing the Compasses in the Point E, describe the Arch HI; then from the Point B, and through the Intersection of the two Arches FG and HI, draw the Perpendicular which was required.

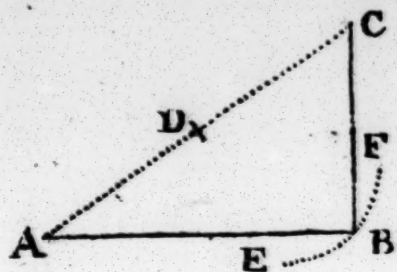


Prob. III. To let fall a Perpendicular from a Point assigned over a given Right Line.

Let AB be the Line given, C the Point over the Line from which the Perpendicular is to fall; to do which, place one Foot of the Compasses in the point C, then opening them to a convenient Distance, mark the Line AB in two Points with the said Distance, as in the Points A and B; then with one Foot of the Compasses in the Point A, describe the Arch EF, and with one Foot in the Point B, describe the Arch GH; then from the Point C, and through the Intersection of the said two Arches, draw the Perpendicular CD, which was required.



Prob. VI. *Another way to let fall a Perpendicular from a given Point the a given Right Line.*



Let the Line given be AB, upon which it is required to let fall a Perpendicular from the Point C; to do which, from the Point assigned C, draw the Line CA; which Line divide into two equal Parts, as in the Point D; then one Foot of the Compasses resting in the point D, with the same distance, (*viz.* of half the Line AC) describe the Arch EF: then from the Point

C, to the Intersection of the Arch EF with the Line AB, draw the Perpendicular CB.

Prob. V. *To draw a Line parallel to a Line given.*

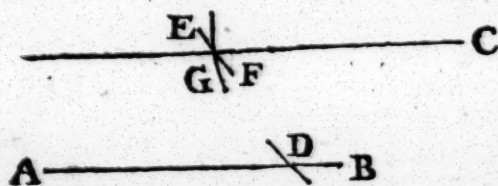


Let AB be a Line given, to which it is required to draw a Line parallel; to do which, first take in the Compasses the distance at which the parallel Line is to be drawn, and then setting one Foot of the Compasses in

the Point C, on the Line AB, describe the Arch E; and with the same distance, with one Foot of the Compasses in the Point D, describe the Arch F; then laying a Ruler to touch the Convexity of the two Arches, draw the parallel Line EF.

Prob. VI. *To draw a Right Line parallel to a given one, that shall pass through a Point given.*

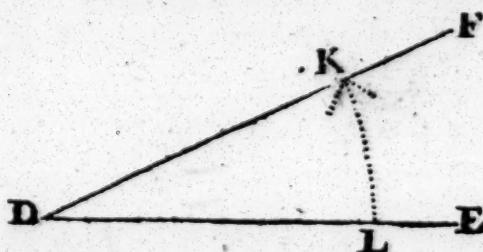
Suppose AB the given Line, and it's required to draw a Line parallel thereto, that shall pass thro' a given Point, as C.



Set one Foot of the Compasses in C, with the other at any distance, cross AB in D, and with that distance from any Point as A, of the Line AB describe an Arch EF; then from C with the distance AD cross the Arch in G; and draw the Line CG,

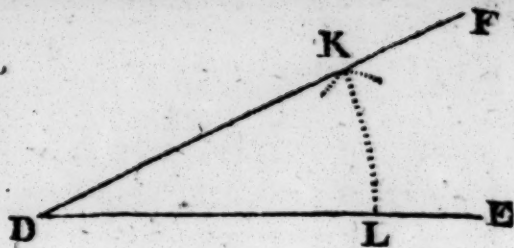
which shall be parallel to the given Line AB, as was required.

P R O B. VII. *To make an Angle equal to an Angle given.*



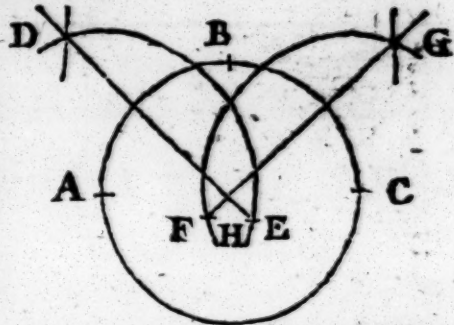
Suppose FDE an Angle given, and it is required to make another Angle equal thereto: To do this, first draw the Line DE, then with any convenient Distance less than DE, describe the Arch KL, then placing the Compasses at D, with the same Distance which swept the Arch

Arch KL sweep the Arch KL; take the Arch KL in the Compasses, and setting one Foot in the Point L, cross the Arch LK in the Point K, then through the Point K draw the Line DKF, then is the Angle EDF equal to the Angle EDF, as was required.



Prob. VIII. To bring any three Points not situate in a Right Line, into the Circumference of a Circle.

Let the three Points thro' which the Circle is to pass be ABC: Take above half the Distance between the two Points A and B in the Compasses; and on Foot of the Compasses being in the Point A, with the said Distance describe the Arch ED; and with the same Distance, one Foot of the Compasses being in the Point B, mark the Arch ED in the Points E and D, and draw the Right Line ED;



then take above half the distance between the Points C and B in the Compasses, and one Foot of the Compasses being in the Point C, with the said distance describe the Arch FG; and with the same distance, one Foot of the Compasses being in the Point B, mark the Arch FG, in the Points F and G, and draw the Right Line FG. Now where the two Right Lines DE and FG, being continued intersect each other (*viz.* in the Point H) is the Center of the Circle, which was required.

The Description of the Mariner's Compass.

THIS Instrument, so beneficial an Assistant to the *Practical Part* in Navigation, as to its Inventor, is uncertainly discoursed of; its Age, by some supposed to be in these Parts of the World about 300 Years; the Utility whereof to us evidently appears, considering the many Inconveniences that attended our Ancestors, in tracing the vast Ocean, for want of such a Guide, under whose subordinate Conduct of later Years, our Maritime Affairs have succeed so well.

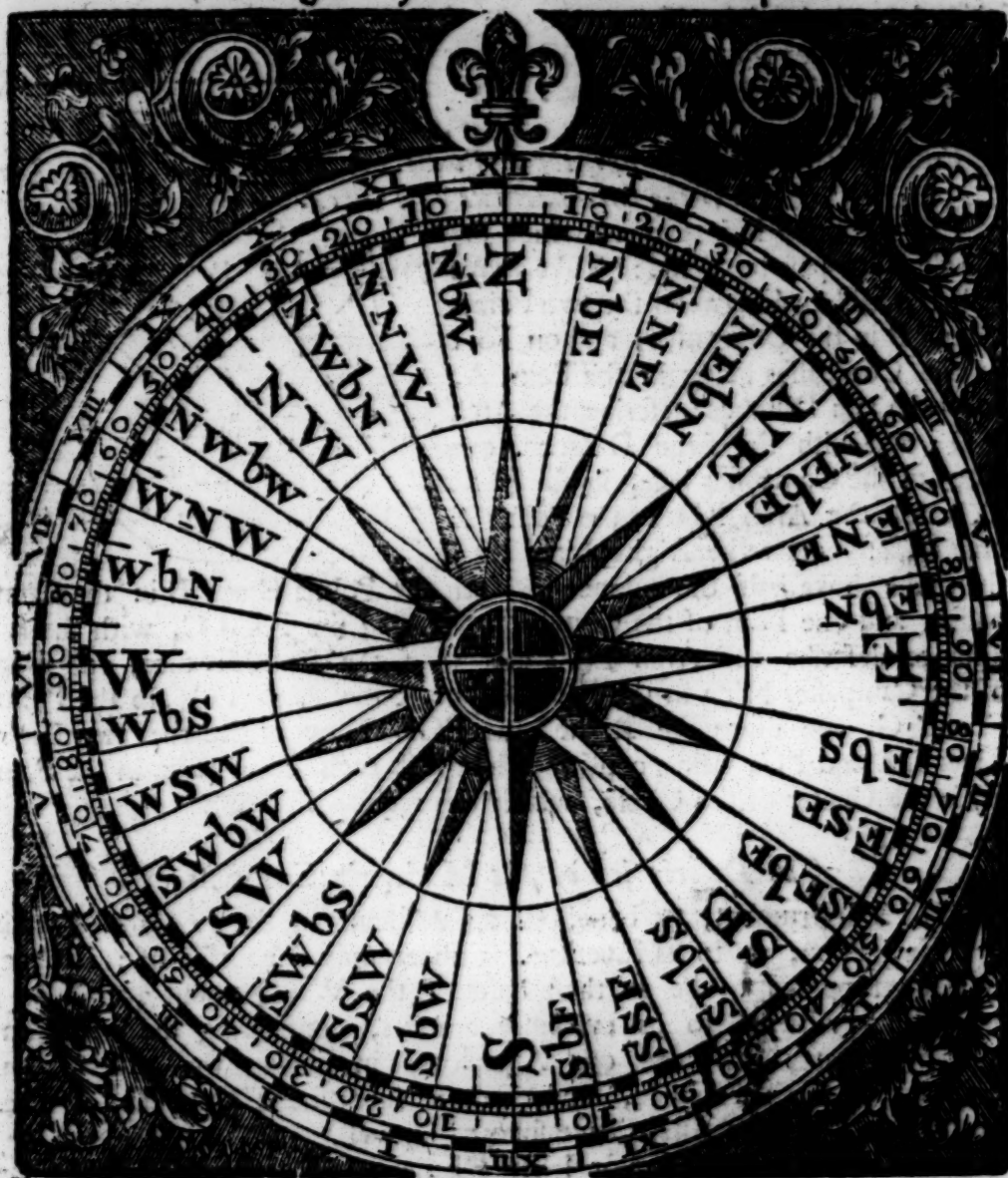
It is a Circle of a greater or lesser Diameter at Pleasure, described upon a Paste-board, and divided into 360 Degrees, and 32 Points, (and sometimes into 24 Hours) each Point containing 11 deg. 15 min. or 3 quarters of an Hour; as in the following Figure.

The Circle being thus divided upon the Chard or Paste-board, there are pasted on the other Side of the said Chard or Paste-board, two Wires, which Wires being touched with the Loadstone, and the Chard hung at the Center upon a Pin, fix'd in a Box, its Position becomes North or South;

The Mariner's Compass.

and the said Box being cover'd with a Glas, and hung in another square Box, to the End the Chard may traverse notwithstanding the Ship's Motion, being thus fixed, is ready for Use.

The Figure of the Mariner's Compass.



To find the Prime or Golden Number.

THE Prime or Golden Number, is a Revolution of nineteen Years, in which Term the Moon returns to make the same Aspects with the Sun on the same Day of the Month (most commonly) that they were on Nineteen Years before.

To find which, add 1 to the Year of our Lord, and divide by 19, the Remainder is the Prime or Golden Number, but if nothing remains the Prime is 19.

Example

Example. To find the Golden Number for the Year 1746, add 1, which makes 1747; which divide by 19.

$$\begin{array}{r} 19 \overline{) 1747 (91} \\ \underline{171} \\ 37 \\ \underline{19} \\ 18 \end{array}$$

The Remainder 18 is the Golden Number for the Year 1746.

To find the Epact.

THE *Epact* is the Number of Days that the *Solar Year* of 365 Days exceeds the *Lunar Year* (or 12 Revolutions of the Moon to the Sun) of 354 Days, the Difference being 11 Days: When the Golden Number is 1, the Epact is 11; when 2, the Epact is twice 11 or 22; when 3, thrice 11 or 33 (rejecting 30) that is 3, &c. and it is thus found: Divide the Prime by 3, if 0 remains, the Epact is the same with the Prime; if 1 remain add 10, if 2 add 20 to the Prime, the Sum (rejecting 30, if need be) is the Epact.

Examp. In the Year 1759, the Golden Number is 12; which divide by 3 there remains 0; which shews the Epact is 12, the same with the Prime.

In the Year 1748, the Golden Number is 1, which added to 10 (because 1 cannot be divided by 3) makes 11 for the Epact.

In the Year 1762, the Golden Number is 15, which divided by 3, there remains 0, therefore the Epact is 15, the same with the Golden Number.

Or, Multiply the Golden Number by 11, and divide the Product by 30, the Remainder is the Epact.

To find the Moon's Age.

ADD to the Epact for *March* 1, for *April* 2, for *May* 3, for *June* 4, for *July* 5, for *August* 6, for *September* 8, for *October* 8, for *November* 10, for *December* 10, for *January* 0, for *February* 2.

Having added to the Epact the Number for the Month, according to the Rule foregoing, add thereto the Day of the Month, for which the Moon's Age is required: these three Sums added together, if less than 30, is the Moon's Age; if more than 30, then divide it by 30, the Remainder is the Age of the Moon. The Moon's Age subtracted from 30, leaves the Day of the Change. Again, 15 added to, or subtracted from the Day of the Change, leaves the Day of Full Moon.

Example. Suppose it were requir'd to find the Moon's Age for the first Day of *April*, 1746.

First, Set down the Epact for that Year ——— 18

To which add the Number for the Month, which is ——— 2

To that add the Day of the Month, which is ——— 1

Sum, gives the Moon's Age ——— 21

Then out of 30

Take ——— 21 The Moon's Age.

Remains ——— 09 Days to Change

Add ——— 15

Makes ——— 24 Days to the Full Moon.

To

The Julian Kalendar.

To find Moon's Southing by her Age, see in the Use of the Tide-Table, which follows immediately after it.

To find the Dominical Letter.

TAKE the Year and its fourth Part, and add 4 to it; then divide that Sum by 7, and subtract what remains from 7, the Remainder shews the thing required; accounting the Letter A for 1, B for 2, C for 3, D for 4, E for 5, F for 6, G for 7.

Suppose the Dominical Letter was required for the Year 1747

First, Set down the Year 1747

Then the 4th Part which omitting Fractions is 436

To which add 4

The Sum divided by 7 $2187(312$
 21

The Remainder after Division is 3, which being subtracted from 7, leaves 4; which shews it must be the fourth Letter, which is D, the Dominical Letter for the Year 1747. But when it is Leap-year, there are two Dominical Letters, and then the Letters thus found serves from the last of February to the End of the Year.

8
7
17
14
3
7
4

To find the Cycle of the Sun.

ADD to the Year 9, divide the Sum by 28, the Remainder is the Cycle of the Sun.

Suppose it be required for the Year 1751

Then add 9

Divide by 28 $1760(6$
 168

80
56
24

By the Operation it appears, that 24 is the Cycle of the Sun for the Year 1751, being the Remainder after the Division.

Note, Hillary Term begins Jan. 23. and ends Feb. 12.

Easter Term begins 17 Days after Easter-day, and ends Monday before Whitsunday.

Trinity Term begins on Friday after Trinity Sunday, and ends nineteen Days after.

Michaelmas Term begins October 23, and ends November 28.

A Table

Table of the Moon's Age for the Year 1746.

23

Months		D. H.		Months		D. H.	
January	Last quart.	3	1 A	July	New moon	7	2 M
	New moon	10	5 A		First quart.	14	1 M
	First quart.	18	7 A		Full moon	21	11 A
	Full moon	25	5 M		Last quart.	29	10 A
February	Last quart.	1	10 A	August	New moon	5	mid.
	New moon	8	10 M		First quart.	12	6 A
	First quart.	17	3 A		Full moon	19	mid.
	Full moon	24	4 A		Last quart.	28	3 M
March	Last quart.	3	7 M	September	New moon	4	9 M
	New moon	11	3 M		First quart.	10	mid.
	First quart.	19	6 M		Full moon	18	4 A
	Full moon	26	1 M		Last quart.	26	8 A
April	Last quart.	1	7 A	October	New moon	3	1 A
	New moon	9	9 A		First quart.	10	10 M
	First quart.	17	6 A		Full moon	18	9 M
	Full moon	24	9 M		Last quart.	26	10 M
May	Last quart.	1	8 M	November	New moon	2	4 M
	New moon	9	noon		First quart.	8	mid.
	First quart.	17	2 M		Full moon	17	4 M
	Full moon	23	5 A		Last quart.	24	11 A
June	Last quart.	30	mid.	December	New moon	1	2 A
	New moon	8	2 M		First quart.	8	6 A
	First quart.	15	8 M		Full moon	16	10 A
	Full moon	22	1 M		Last quart.	24	9 M
	Last quart.	29	5 A		New moon	31	2 M

There will four Eclipses this Year.

The First is Feb. 24, at 4 Aft, invisibl, for the Eclipse ends 23' e'er the Moon rises, two-thirds of the Diam. on the lower side will be darkned. The Second is of the Sun invisibl, on March the 11th at 2 in the Morn. The third is of the Moon, visible at London, the 19th of August at Mid-night, six Digits on the upper Side. The fourth Eclipse is of the Sun, on September the 4th, at 9 in the Morning invisibl, by reason of the Moon's great South Latitude.

Months		D. H.		Months		D. H.	
January	First quart	7	1 A	July	First quart.	4	8 M
	Full moon	15	4 A		Full moon	10	11 M
	Last quart.	22	5 A		Last quart.	18	6 M
	New moon	29	3 A		New moon	26	9 M
February	First quart	6	11 M	August	First quart.	2	2 A
	Full moon	14	5 M		Full moon	9	5 M
	Last quart	21	1 M		Last quart.	16	11 A
	New moon	18	4 M		New moon	24	9 A
March	First quart	8	8 M	September	First quart.	31	9 A
	Full moon	15	5 A		Full moon	7	6 A
	Last quart.	22	9 M		Last quart.	15	8 A
	New moon	29	9 A		New moon	23	9 M
April	First quart.	7	2 M	October	First quart.	30	2 M
	Full moon	14	2 M		Full moon	7	10 M
	Last quart.	20	6 A		Last quart.	15	2 A
	New moon	28	1 A		New moon	22	8 A
May	First quart.	6	4 A	November	First quart.	29	11 M
	Full moon	13	9 M		Full moon	6	3 M
	Last quart.	20	4 M		Last quart.	14	6 M
	New moon	28	4 M		New moon	21	8 M
June	First quart.	5	1 M	December	First quart.	27	10 M
	Full moon	11	4 A		Full moon	5	10 A
	Last quart.	13	3 A		Last quart.	13	10 A
	New moon	26	7 A		New moon	20	5 A
					First quart.	27	1 A

Six Eclipses this Year, four of the Sun, and two of the Moon.

The First will be of the Sun, Jan. the 29th, invisible.

The Second will be of the Moon, Feb. the 13th, visible and total.

The Third will be of the Sun, July the 26th, invisible.

The Fourth will be of the Moon, August the 9th, invisible.

The Fifth will be of the Sun, August the 24th, invisible.

The Sixth will be of the Sun, September the 23d, invisible.

A Table of the Moon's Age for the Year 1748. 25

Months	D.	H.	Months	D.	H.
January {	Full moon	4 6 A	July {	Last quart.	6 10 M
	Last quart.	12 11 M		New moon	14 11 M
	New moon	19 3 M		First quart.	22 5 M
	First. quart	26 8 M		Full moon	28 mid.
February {	Full moon	3 noon	August {	Last quart.	4 11 A
	Last quart.	10 10 A		New moon	13 5 M
	New moon	17 3 A		First quart.	20 5 A
	First quart.	25 3 M		Full moon	27 8 M
March {	Full moon	4 6 M	September {	Last quart.	3 3 A
	Last quart.	11 6 M		New moon	11 6 A
	New moon	18 3 M		First quart.	18 mid.
	First quart.	25 12 A		Full moon	25 6 A
April {	Full moon	2 4 A	October {	Last quart.	3 10 M
	Last quart.	9 noon		New moon	11 8 M
	New moon	16 4 A		First quart.	18 6 M
	First quart.	24 6 A		Full moon	25 7 M
May {	Full moon	2 2 M	November {	Last quart.	2 7 M
	Last quart.	8 6 A		New moon	9 8 A
	New moon	16 5 M		First quart.	16 2 A
	First quart.	24 9 M		Full moon	23 11 A
	Full moon	31 9 M			
June {	Last quart.	6 mid.	December {	Last quart.	2 3 M
	New moon	14 8 A		New moon	9 8 M
	First quart.	22 9 A		First quart.	15 11 A
	Full moon	29 5 A		Full moon	23 5 A
				Last quart.	31 9 A

Four Eclipses this Year, two of the Sun and two of the Moon.

The First will be of the Sun, *January* the 18th, invisible.

The Second will be of the Moon, *February* the 3d, invisible.

The third will be of the Sun, *July* the 14th, visible 10 Digits.

The Fourth will be of the Moon, *July* the 28th, visible 6 Digits.

Months		D. H.		Months		D. H.	
January	New moon	7	7 A	July	New moon	3	1 A
	First quart.	14	noon		First quart.	11	4 A
	Full moon	22	1 A		Full moon	18	9 A
	Last quart.	30	1 A		Last quart.	25	3 M
February	New moon	6	5 M	August	New moon	2	3 M
	First quart.	13	4 M		First quart.	10	6 M
	Full moon	21	7 M		Full moon	16	12 A
	Last quart.	28	12 A		Last quart.	23	7 A
March	New moon	7	3 A	September	New moon	31	7 A
	First quart.	14	5 A		First quart.	8	5 A
	Full moon	22	11 A		Full moon	15	8 M
	Last quart.	30	8 M		Last quart.	22	9 M
April	New moon	6	1 M	October	New moon	30	noon
	First quart.	13	2 A		First quart.	8	2 M
	Full moon	21	1 A		Full moon	14	6 A
	Last quart.	28	2 A		Last quart.	22	1 M
May	New moon	5	11 M	November	New moon	30	5 M
	First quart.	13	8 M		First quart.	6	10 M
	Full moon	20	12 A		Full moon	13	6 M
	Last quart.	27	7 A		Last quart.	20	9 A
June	New moon	3	11 A	December	New moon	28	8 A
	First quart.	12	1 M		First quart.	5	6 A
	Full moon	19	9 M		Full moon	12	8 A
	Last quart.	26	1 M		Last quart.	20	8 A
					New moon	28	10 M

Five Eclipses this Year, three of the Sun and two of the Moon.

The first will be of the Sun, *January* the 7th, invisible.

The Second will be of the Moon, *June* the 19th, invisible.

The Third will be of the Sun, *July* the 3d, invisible.

The fourth will be of the Moon, *December* the 12th, visible 6 Digits.

The Fifth will be of the Sun, *December* the 28th, visible 8 Digits.

A Table of the Moon's Age for the Year 1750. 27

Months	D.	H.	Months	D.	H.
January	First quart.	4 4M	July	Full moon	8 8M
	Full moon	11 1 A		Last quart.	15 3M
	Last quart.	19 5 A		New moon	22 7M
	New moon	26 10 A		First quart.	30 9M
February	First quart.	2 2 A	August	Full moon	6 5 A
	Full moon	10 7M		Last quart.	13 8M
	Last quart.	18 11M		New moon	20 9 A
	New moon	25 8M		First quart.	28 12 A
March	First quart.	3 12 A	September	Full moon	5 1M
	Full moon	11 12 A		Last quart.	11 4 A
	Last quart.	20 1M		New moon	19 100n
	New moon	26 4 A		First quart.	27 2 A
April	First quart.	2 2 A	October	Full moon	4 10M
	Full moon	10 5 A		Last quart.	11 4M
	Last quart.	18 10M		New moon	19 8M
	New moon	24 12 A		First quart.	27 3M
May	First quart.	2 5M	November	Full moon	2 7 A
	Full moon	10 8M		Last quart.	9 7 A
	Last quart.	17 4 A		New moon	18 1M
	New moon	24 10M		First quart.	25 2 A
	First quart.	31 9 A	December	Full moon	2 6M
June	Full moon	8 9 A		Last quart.	9 3 A
	Last quart.	15 10 A		New moon	17 6 A
	New moon	22 7 A		First quart.	24 11 A
	First quart.	30 3 A		Full moon	31 8 A

Five Eclipses this Year, three of the Sun, and two of the Moon.

The first is of the Moon, *June* the 8th, visible and total.

The Second is of the Sun, *June* the 22d, invisible.

The third of the Sun, *November* the 18th, invisible.

The Fourth of the Moon, *December* the 2d, visible and total.

The Fifth of the Sun, *Decemb.* the 17th, invisible.

28 *A Table of the Moon's Age for the Year 1751.*

Months		D. H.		Months		D. H.	
January	Last quart.	8	9M	July	Last quart.	4	10 A
	New moon	16	9M		New moon	11	5 A
	First quart.	23	8M		First quart.	19	7M
	Full moon	30	2 A		Full moon	27	4M
February	Last quart.	7	9M	August	Last quart.	3	5M
	New moon	14	mid.		New moon	10	3M
	First quart.	21	4 A		First quart.	17	10 A
	Full moon	28	12M		Full moon	25	4 A
March	Last quart.	9	2M	September	Last quart.	1	noon
	New moon	16	10M		New moon	8	3 A
	First quart.	24	3 A		First quart.	16	1 A
	Full moon	30	6 A		Full moon	24	2M
April	Last quart.	7	4 A	October	Last quart.	30	10 A
	New moon	14	3 A		New moon	8	7M
	First quart.	21	4 A		First quart.	16	7M
	Full moon	29	11M		Full moon	23	noon
May	Last quart.	7	4M	November	Last quart.	30	8M
	New moon	14	2M		New moon	7	1M
	First quart.	21	5M		First quart.	14	9 A
	Full moon	29	2M		Full moon	21	10 A
June	Last quart.	5	2 A	December	Last quart.	28	10 A
	New moon	12	8M		New moon	6	7 A
	First quart.	19	3 A		First quart.	14	noon
	Full moon	27	4 A		Full moon	21	noon
					Last quart.	28	2 A

There will be four Eclipses this Year, two of the Sun and two of the Moon.

The First will be of the Sun, *May* the 14th, invifible.

The Second will be of the Moon, *May* the 29th, vifible 10 Digits.

The third will be of the Sun, *November* the 7th, invifible.

The Fourth will be of the Moon, *Novemver* the 21st, vifible 8 Digits.

A Table of the Moon's Age for the Year 1752. 29

Months	D.	H.	Months	D.	H.
January	New moon	5 1 A	July	First quart.	7 10 M
	First quart.	13 mid.		Full moon	15 7 M
	Full moon	19 8 A		Last quart.	22 9 A
	Last quart.	27 8 M		New moon	29 3 A
February	New moon	4 7 M	August	First quart.	5 11 A
	First quart.	11 10 M		Full moon	13 11 A
	Full moon	18 8 M		Last quart.	21 5 M
	Last quart.	26 1 M		New moon	28 mid.
March	New moon	4 9 A	September	First quart.	4 3 A
	First quart.	11 6 A		Full moon	12 1 A
	Full moon	19 3 M		Last quart.	19 1 A
	Last quart.	26 6 A		New moon	26 noon
April	New moon	3 9 M	October	First quart.	4 9 M
	First quart.	10 4 M		Full moon	12 2 M
	Full moon	17 11 M		Last quart.	18 11 A
	Last quart.	25 9 M		New moon	26 2 M
May	New moon	2 6 A	November	First quart.	5 2 M
	First quart.	9 1 A		Full moon	10 1 A
	Full moon	17 3 M		Last quart.	17 9 M
	Last quart.	25 mid.		New moon	24 7 A
June	New moon	1 1 M	December	First quart.	2 7 A
	First quart.	7 11 A		Full moon	10 1 M
	Full moon	15 5 A		Last quart.	16 9 A
	Last quart.	23 11 M		New moon	24 10 M
	New moon	30 8 M			

There will be two Eclipses this Year, both of the Sun.

The First will be on *May* the 2d, invisible.

The second will be on *October* the 26th, invisible.

30 *A Table of the Moon's Age for the Year 1753.*

Months		D. H.		Months		D. H.	
January	First quart.	1	noon	July	Full moon	4	10 M
	Full moon	8	10 M		Last quart.	11	8 M
	Last quart.	15	11 M		New moon	19	8 M
	New moon	23	8 M		First quart.	26	6 M
	First quart.	31	1 M	August	Full moon	2	mid.
February	Full moon	6	8 A		Last quart.	10	7 A
	Last quart.	14	2 M		New moon	17	4 A
	New moon	22	2 M		First quart.	24	8 A
	First quart.	28	12 A	September	Full moon	1	8 A
March	Full moon	8	7 M		Last quart.	9	3 M
	Last quart.	15	7 A		New moon	15	9 A
	New moon	23	2 M		First quart.	23	9 M
	First quart.	30	3 M	October	Full moon.	1	10 M
April	Full moon	6	6 A		Last quart.	8	3 A
	Last quart.	14	noon		New moon	15	10 M
	New moon	22	8 M		First quart.	23	3 M
	First quart.	29	4 M		Full moon	30	mid.
May	Full moon	6	6 M	November	Last quart.	7	2 M
	Last quart.	14	3 M		New moon	13	mid.
	New moon	21	6 M		First quart.	21	8 A
	First quart.	28	noon		Full moon	29	2 A
June	Full moon	4	7 A	December	Last quart.	6	11 M
	Last quart.	12	7 A		New moon	13	3 A
	New moon	20	2 A		First quart.	21	2 A
	First quart.	26	9 A		Full moon	28	11 A

Four Eclipses this Year, two of the Sun and two of the Moon.

The First is of the Moon, *April* the 6th riseth eclipsed, 5 Digits.

The Second is of the Sun, *April* the 22d, invifible.

The third is of the Moon, *October* the 1st, invifible.

The Fourth is of the Sun, *October* the 15th, vifible 5 Digits.

A Table of the Moon's Age for the Year 1754. 31

Months	D.	H.	Months	D.	H.
January {			July {		
Last quart.	4	5 A	Last quart.	1	10 M
New moon	12	8 M	New moon	9	1 M
First quart.	20	8 M	First quart.	15	6 A
Full moon	27	1 A	Full moon	23	2 M
			Last quart.	31	1 M
February {			August {		
Last quart.	3	10 M	New moon	7	10 M
New moon	11	2 M	First quart.	14	4 M
First quart.	18	mid.	Full moon	21	5 A
Full moon	25	mid.	Last quart.	29	3 A
March {			September {		
Last quart.	5	1 M	New moon	5	1 A
New moon	12	6 A	First quart.	13	10 M
First quart.	20	1 A	Full moon	20	10 M
Full moon	27	8 M	Last quart.	28	5 M
April {			October {		
Last quart.	3	2 A	New moon	5	2 M
New moon	11	10 M	First quart.	12	5 M
First quart.	18	10 A	Full moon	20	4 M
Full moon	25	4 A	Last quart.	27	4 A
May {			November {		
Last quart.	3	4 M	New moon	3	10 M
New moon	11	3 M	First quart.	10	8 M
First quart.	18	5 M	Full moon	18	9 A
Full moon	24	11 A	Last quart.	26	3 M
June {			December {		
Last quart.	1	10 A	New moon	2	11 A
New moon	9	3 A	First quart.	10	3 A
First quart.	16	3 A	Full moon	18	noon
Full moon	23	2 A	Last quart.	25	5 A

Six Eclipses this Year, four of the Sun, and two of the Moon.

The First is of the Sun, *March* the 12th, invisible.

The Second is of the Moon, *March* the 27th, visible 22 Digits.

The Third is of the Sun, *April* the 11th, invisible.

The Fourth is of the Sun, *September* the 5th, invisible.

The Fifth is of the Moon, *September* the 20th, visible 21 Digits.

The Sixth is of the Sun, *October* the 5th, invisible.

The Use of the foregoing Table of the Moon's Age.

IN the said Table the one half Page contains the first six Months of the Year, the other half the following six Months; in the first Column of each half, towards the Left-hand, are the Months; in the second the New, Full, and Quarters of the Moon; in the two following Columns are the Days and Hours of the said New, Full, and Quarters, either Morning or Afternoon, as the Letters A and M denote, A signifying Afternoon, M Morning. At the Bottom of the Tables are the Eclipses for the respective Year.

The Use of the Table is, readily by Inspection, to find the Day and Hour, of the New, Full, or Quarters of the Moon.

Example 1. Suppose it were desired to find the time of New-moon, *Jan.* 1746. First look for the Year 1746 on the Top of the Leaf, which having found, look for *January* in the first Column towards the Left-hand; then in the next Column in the same Month is found New-moon; and in the two following Columns against New-moon stands 10.5 A, which shews that the New-moon in *January* 1746 is the 10th Day at 5 Afternoon. The same Directions serve for the Full-moon, or first and last Quarters.

To find the Moon's Age, subtract the Day of the Change or New-moon from the Day proposed, the Remainder is the Moon's Age. Suppose therefore it was required to find the Moon's Age for *March* 30, 1748.

Looking in the Year 1748, the Table gives the New-moon for *March* to be on the 18th Day, therefore 18 being subtracted from 30, there remains 12, whereby it appears the Moon is 12 Days old on the 30th of *March* in the Year 1748.

Example. Suppose it were required to find the Moon's Age on the 1st of *November*, 1746.

The last New-moon before *Nov.* 1st was *Oct.* 3d, but because you cannot take 3 from 1, you must add 31 (the Number of Days in *Octob.*) and from the Sum 32 subtract 3: the Remainder 29 is the Moon's Age required.

A Tide-Table for the Sea-Coasts of Great-Britain, Ireland, Norway, Holland, Flanders, France, Biscay, &c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, in Alphabetical Order.

A		H. M.	At Abermorich, & Antwerp,		H. M.
A	T Army, NNE. and SSW.	01 30	East and West	—	06 00
	At Amsterdam and Arm-		At Alberough, S E. by S. and		
	tiers, NE. and SW. —	03 00	NW. by N. —	—	09 45
	At Abarwark, E N E. and				
	W S W. — — —	04 30			At

The Tide-Table.

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B		H.M.	Between Guernsey and the	H.M.
At <i>Beachy</i> and <i>Blacktail</i> , and before the <i>Race of Blan-</i> <i>quet</i> , N and S ———		12 00	<i>Caskets</i> , before <i>Cromer</i> , before the <i>Caskets</i> and <i>Guernsey</i> , <i>Seven</i> <i>Glists</i> , and at <i>Catnejs</i> , SE and NW. ———	09 00
Thwart of <i>Beachy</i> in the <i>Of-</i> <i>fing</i> , N by E and S by W ———		00 45	At the <i>Caskets</i> , and at <i>Cham-</i> <i>berness</i> , SE by S. and NW by N.	09 45
At <i>Blackness</i> , in <i>Bluet</i> , at <i>Bell</i> <i>Ile</i> , NNE and SSW ———		01 30	At <i>Cows</i> , in the <i>Foss of Caen</i> , in <i>Calice Road</i> , and in <i>Chamber-</i> <i>ness-Road</i> , SSE and NNW ———	10 30
Without <i>Bluet</i> , and at <i>Ber-</i> <i>wick</i> , NE by N and SW by S ———		02 15	Before the Haven of <i>Caen</i> , in the <i>Chamber</i> , between <i>Crip-</i> <i>ple-sant</i> and the <i>Creyt</i> , and at <i>Calshot</i> , S by E and N by W ———	11 15
The River of <i>Bordeaux</i> , the Sout ^h Coast of <i>Bretagne</i> , the Coast of <i>Biscay</i> , and at <i>Bocknejs</i> , NE and SW ———		03 00	D	
At <i>Brest</i> before the <i>Base</i> , the Ri- ver of <i>Bordeaux</i> within the Ha- ven, NE by E and SW by W. ———		03 45	At <i>Dover Pier</i> , and before <i>Dunkirk</i> , North and South ———	12 00
In the <i>Breesound</i> , <i>Bloy</i> , <i>Bal-</i> <i>timore</i> , ENE and WSW ———		04 30	At <i>Denbeigh</i> and <i>Downs</i> in the Road, NE by N. and SW by S ———	02 15
Before <i>Bremen</i> , and at <i>Black-</i> <i>ncy</i> , and in the Channel before <i>Bordeaux</i> , East and West ———		06 00	At <i>Dort</i> , NE and SW ———	03 00
At <i>Bristol Key</i> , E by S. and W by N ———		06 45	At <i>Dungervan</i> , ENE. and WSW ———	04 30
At <i>Bridgwater</i> , ESE. and WNW ———		07 30	At <i>Dartmouth</i> , East and West ———	06 00
At <i>Bullen-deep</i> , SSE&NNW ———		10 30	At <i>Dublin</i> , S.E. by E. and NW by W ———	08 15
C			At <i>Dunbar</i> , SE and NW ———	09 00
In <i>Condado</i> , N and S. ———		12 00	At <i>Dungeness</i> and <i>Dunnose</i> , SE by S. and NW by N ———	09 45
In the <i>Chamber of Rye</i> , N by E. and S by W. ———		00 45	At <i>Dover</i> , <i>Diep</i> , and in the <i>Downs</i> ashore, SSE. and N. NW ———	10 30
Without <i>Calice</i> , at <i>Corpus</i> <i>Christi</i> Point, before and at <i>Camfer</i> , NNE. and SSW ———		01 30	E	
Between <i>Calice</i> and <i>Dover</i> , before <i>Conquet</i> , and at the N. Cape, NE. and SW. ———		03 00	At <i>Embsen</i> , before the <i>Elve</i> , before the <i>Eyder</i> , and before <i>Enchusen</i> , North and South ———	12 00
At <i>Cork</i> , <i>Calice</i> , C. Clear and in the <i>Creek</i> , ENE. and WSW. ———		04 30	At <i>Edam</i> , NNE and SSW. ———	01 30
At <i>Caldy</i> , and in the Bay of <i>Carmarthen</i> , E by N & W by S ———		05 15	Before the Eastern and West- ern <i>Emes</i> , and at <i>Engemonts</i> , SE. and NW. ———	09 00
At <i>Concalo</i> , E and W ———		06 00	F	
Without the <i>Caskets</i> , in the Channel SE by E. and NW by W. ———		08 15	On the Coast of <i>Flanders</i> , North and South ———	12 00
			At <i>Flushing</i> , N by E and S by W ———	00 45
			E	Before

The Use of the foregoing Table of the Moon's Age.

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The Use of the Table is, readily by Inspection, to find the Day and Hour, of the New, Full, or Quarters of the Moon.

Example 1. Suppose it were desired to find the time of New-moon, Jan. 1746. First look for the Year 1746 on the Top of the Leaf, which having found, look for *January* in the first Column towards the Left-hand; then in the next Column in the same Month is found New-moon; and in the two following Columns against New-moon stands 10.5 A, which shews that the New-moon in *January* 1746 is the 10th Day at 5 Afternoon. The same Directions serve for the Full-moon, or first and last Quarters.

To find the Moon's Age, subtract the Day of the Change or New-moon from the Day proposed, the Remainder is the Moon's Age. Suppose therefore it was required to find the Moon's Age for *March* 30, 1748.

Looking in the Year 1748, the Table gives the New-moon for *March* to be on the 18th Day, therefore 18 being subtracted from 30, there remains 12, whereby it appears the Moon is 12 Days old on the 30th of *March* in the Year 1748.

Example. Suppose it were required to find the Moon's Age on the 1st of *November*, 1746.

The last New-moon before *Nov.* 1st was *Oct.* 3d, but because you cannot take 3 from 1, you must add 31 (the Number of Days in *Octob.*) and from the Sum 32 subtract 3: the Remainder 29 is the Moon's Age required.

A Tide-Table for the Sea-Coasts of Great-Britain, Ireland, Norway, Holland, Flanders, France, Biscay, &c. Shewing what Moon makes Full Sea, upon the Full and Change Days, at the Places following, in Alphabetical Order.

A		H.	M.	At Abermorich, & Antwerp,		H.	M.
A	T Army, NNE. and SSW.	01	30	East and West	—	06	00
	At Amsterdam and Arm- en-tiers, NE. and SW.	03	00	At Albarough, S E. by S. and NW. by N.	—	09	45
	At Abarwark, E N E. and W S W.	04	30				

The Tide-Table.

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B		H.M.	Between Guernsey and the	H.M.
At <i>Beachy</i> and <i>Blacktail</i> , and before the <i>Race of Blan-</i> <i>quet</i> , N and S ———		12 00	<i>Caskets</i> , before <i>Cromer</i> , before the <i>Caskets</i> and <i>Guernsey</i> , <i>Seven</i> <i>Clifts</i> , and at <i>Catnejs</i> , SE and NW. ———	09 00
Thwart of <i>Beachy</i> in the <i>Of-</i> <i>ing</i> , N by E and S by W ———		00 45	At the <i>Caskets</i> , and at <i>Cham-</i> <i>bernefs</i> , SE by S. and NW by N.	09 45
At <i>Blacknefs</i> , in <i>Bluet</i> , at <i>Bell</i> <i>Iffe</i> , NNE and SSW ———		01 30	At <i>Cows</i> , in the <i>Foss of Caen</i> , in <i>Calice Road</i> , and in <i>Chamber-</i> <i>nefs-Road</i> , SSE and NNW —	10 30
Without <i>Bluet</i> , and at <i>Ber-</i> <i>wick</i> , NE by N and SW by S		02 15	Before the Haven of <i>Caen</i> , in the <i>Chamber</i> , between <i>Crip-</i> <i>ple-faul</i> and the <i>Creyt</i> , and at <i>Calshot</i> , S by E and N by W —	11 15
The River of <i>Bordeaux</i> , the Sout ^h Coast of <i>Bretagne</i> , the Coast of <i>Biscay</i> , and at <i>Bocknejs</i> , N E and S W ———		03 00	D	
At <i>Brest</i> before the <i>Base</i> , the Ri- ver of <i>Bordeaux</i> within the Ha- ven, NE by E and SW by W.		03 45	At <i>Dover Pier</i> , and before <i>Dunkirk</i> , North and South —	12 00
In the <i>Breefound</i> , <i>Bloy</i> , <i>Bal-</i> <i>timore</i> , ENE and WSW ———		04 30	At <i>Denbeigh</i> and <i>Downs</i> in the Road, NE by N. and SW by S	02 15
Before <i>Bremen</i> , and at <i>Black-</i> <i>ncy</i> , and in the Channel before <i>Bordeaux</i> , East and West —		06 00	At <i>Dort</i> , NE and SW ———	03 00
At <i>Bristol Key</i> , E by S. and W by N ———		06 45	At <i>Dungervan</i> , ENE. and W S W ———	04 30
At <i>Bridgwater</i> , E S E. and W N W ———		07 30	At <i>Dartmouth</i> , East and West	06 00
At <i>Bullen-deep</i> , SSE & NNW		10 30	At <i>Dublin</i> , S. E. by E. and NW by W ———	08 15
C			At <i>Dunbar</i> , SE and NW	09 00
In <i>Condado</i> , N and S. ———		12 00	At <i>Dungenefs</i> and <i>Dunnofe</i> , SE by S. and NW by N ———	09 45
In the <i>Chamber of Rye</i> , N by E. and S by W. ———		00 45	At <i>Dover</i> , <i>Diep</i> , and in the <i>Downs</i> ashore, S S E. and N.	10 30
Without <i>Calice</i> , at <i>Corpus</i> <i>Christi</i> Point, before and at <i>Camfer</i> , NNE. and SSW ———		01 30	N W ———	
Between <i>Calice</i> and <i>Dover</i> , before <i>Conquet</i> , and at the N. Cape, NE. and SW. ———		03 00	E	
At <i>Cork</i> , <i>Calice</i> , C. Clear and in the <i>Creek</i> , ENE. and WSW.		04 30	At <i>Embden</i> , before the <i>Elve</i> , before the <i>Eyder</i> , and before <i>Enchusen</i> , North and South —	12 00
At <i>Caldy</i> , and in the Bay of <i>Carmarthen</i> , E by N & W by S		05 15	At <i>Edam</i> , NNE and SSW.	01 30
At <i>Concalo</i> , E and W ———		06 00	Before the Eastern and West- ern <i>Emes</i> , and at <i>Engomonts</i> , SE. and NW. ———	09 00
Without the <i>Caskets</i> , in the Channel SE by E. and NW by W. ———		08 15	F	
			On the Coast of <i>Flanders</i> , North and South ———	12 00
			At <i>Fiusbing</i> , N by E and S by W ———	00 45
			E	Before

Before the <i>Fen</i> in the Channel NNE. and SSW	H. M.	Horn, and at <i>Hampton-Key</i> , N and S	H. M.
Without <i>Pountney</i> , NE by N. and SW by S	01 30	Under <i>Holy Island</i> , and at <i>Horn</i> , NNE. and SSW.	12 00
Without the Banks of <i>Flanders</i> , NE. and SW.	02 15	Before <i>Hartlepool</i> , NE. and SW	01 30
At <i>Flamborough</i> and <i>Bridlington</i> , ENE. and WSW	03 00	At <i>Huntcliff-foot</i> , NE by E. and SW by W	03 00
At the <i>Forn</i> , in <i>Fey</i> , at <i>Falmouth</i> , E by N and W by S	04 30	At <i>Humber</i> , E by N & W by S	03 45
Between <i>Fey</i> and <i>Falmouth</i> , in the Channel, and at <i>Foulness</i> , E by S and W by N	05 15	Before <i>Hamborough</i> , at <i>Hull</i> , at the <i>Holms</i> , and before <i>Humber's Mouth</i> , E. and W	05 15
Before the Coast of <i>Friseland</i> , and the <i>Fly</i> , ESE and WNW	06 45	At <i>Harlem</i> , <i>Havre de Grace</i> , and <i>Homehead</i> , SE. and NW.	06 00
Without the <i>Fly</i> , SE by E and NW by W	07 30	At <i>St. Hellens</i> , at <i>Harwich</i> , and without the Banks of <i>Harwich</i> , SSE. and NNW.	09 00
At <i>Friseland</i> and <i>Fair Isle</i> , NW and SE	08 15	At <i>Harwich</i> within, S by E. and N by W	10 30
At the <i>Frith</i> , and at the <i>South Foreland</i> , SSE. and NNW	09 00	I	11 15
In <i>Fair Isle Roads</i> , and at the <i>North Foreland</i> , S. by E. and N by W	10 30	At <i>Jutland Islands</i> N. and S.	12 00
G		On the West Coast of <i>Ireland</i> , NE. and SW.	03 00
In the Road of <i>Gibraltar</i> , at <i>Gravelling</i> , and before <i>Cherbourg</i> , N. and S	11 15	In all the Havens of the South Coast of <i>Ireland</i> , E by N. and W by S	05 15
Before <i>Goeree</i> , at <i>Gaernesey</i> , & at <i>Gravesend</i> , NNE and SSW		K	
At <i>Groin</i> , at <i>Gascoign</i> , and the Coast of <i>Galicia</i> , NE. and SW	12 00	<i>Kentish Knock</i> , N and S	12 00
Between <i>Guernsey</i> and <i>Cafkets</i> , SE and NW	01 30	At <i>Kelliers</i> , NE. and SW	03 00
Thwart of <i>Guernsey</i> in the Channel, SE by S and NW by N	03 00	At <i>Kingsale</i> , ENE & WSW	04 30
In the <i>Chamber</i> and <i>Goeree-end</i> , S by E. and N by W	09 45	At <i>Kilduyn</i> , ESE. and WN	07 30
H		W.	09 00
Before the <i>Hever</i> , before		At <i>Kildive</i> , SE. and NW.	
		L	
		At <i>Leith</i> , North and South	12 00
		At <i>Lisbon</i> , NE. by N. and SW by S	02 15
		At <i>London</i> , NE. and SW.	03 00
		Thwart of <i>Londy</i> , and before <i>Lyn</i> , E by N. and W by S	05 15
		At <i>Lyn</i> half Tide, at <i>Londy</i> , East and West	06 00
		At <i>Lyn</i> , E by S & W by N	06 45
		At	

The Tide-Table.

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At the <i>Lizard</i> by the Land, ESE and WNW ———	H. M.	07 30	Between the <i>Naze</i> and <i>War-</i>	H. M.	11 15
At <i>Lambay</i> , SE by E. and NW by N. ———		08 15	head of <i>Lower</i> , S by E & N by W ———		
At <i>Leostaff</i> , and thwart of it without the Banks, SE by S. and NW by N. ———		09 45	O		
In <i>Leostaff</i> Road, & at <i>Long sand-head</i> , SSE. and NNW M		10 30	At <i>Orkness</i> , NE. and SW. ———		03 00
Within the <i>Maes</i> , at <i>Maldon</i> N by E. and S by W ———		00 45	At <i>Orkney</i> , SE and NW ———		09 00
Before the <i>Maes</i> , NNE. and SSW ———		01 30	At <i>Orfordness</i> , SE by S and NW by N ———		09 45
At the <i>Maes</i> , and before St. <i>Matthew's</i> Point, NE by E. and SW by W ———		03 45	At <i>Orfordness</i> , without the Banks, and between <i>Orford</i> and <i>Orwell Waves</i> , SSE & NNW ———		10 30
In <i>Moufehole</i> , at St. <i>Matthews</i> , and within <i>Mounts-bay</i> , ENE and WSW ———		04 30	At <i>Orfordness</i> , within the Sands, S by E. and N by W. ———		11 15
In <i>Milford</i> , at <i>Moonlefs</i> at St. <i>Maloes</i> , E by N. and W by S. ———		05 15	P		
Between <i>Moufehole</i> and <i>Falmouth</i> and in <i>Milford Haven</i> , ESE. and WNW ———		07 30	At <i>Portsmouth</i> Half-Tide, N and S ———		12 00
In St. <i>Magnes</i> Sound, and at <i>Magnes</i> Castle, SE by E. and NW by W ———		08 15	At the <i>Pens</i> , <i>Portbus</i> , and <i>Poictu</i> , NE. and SW ———		03 00
At the <i>Isle of Man</i> , SE & NW ———		09 00	On the Coast of <i>Portugal</i> , NE by E and SW by W ———		03 00
Before <i>Margate</i> , S by E. and N by W ———		11 15	In <i>Plymouth</i> , and before St. <i>Paul's</i> , E by N and W by S ———		05 00
N			At St. <i>Paul's</i> in the Haven, E and W ———		06 00
At <i>Newport</i> Half-tide N & S ———		12 00	Before <i>Podeffemeck</i> , E by S. and W by N ———		06 45
At the West-end of the <i>Nore</i> , N by E and S by W ———		00 45	Thwart of <i>Plymouth</i> , ESE and WNW ———		07 30
Before the River of <i>Nantz</i> , NE and SW ———		03 00	At the Race of <i>Portland</i> , SE and NW ———		09 00
At <i>Newcastle</i> , E by N & W by S ———		05 15	Q		
Before St. <i>Nicholas</i> , E by S. and W by N ———		06 45	At <i>Quinborough</i> , N and S ———		12 00
At the <i>Needles</i> , at the <i>Isle of Wight</i> , SE by E and NW by W ———		08 15	R		
All the Coast of <i>Normandy</i> , and <i>Picardy</i> , SSE and NNW. ———		10 30	At <i>Rocheſter</i> , N by E & S by W ———		00 45
			At <i>Ramkins</i> , NNE & SSW ———		01 30
			At <i>Rotterdam</i> in <i>Robin Hood's</i> Bay, and from the Race to the <i>Pole-head</i> , NE. and SW ———		03 00
			At <i>Rouen</i> , and before <i>Rochel</i> , NE by E. and SW by W ———		03 45
			In <i>Ramsay</i> , E by N & W by S ———		05 15
			S		
			In the <i>Sleeve</i> between <i>Ushant</i> and <i>Scilly</i> , at the <i>Shoe</i> , at the E 2 Spits ———		

Spits, at Southampton, and along the Swin, N and S —	H. M	In the <i>Vourd</i> , at the Bay, within <i>Ufbant</i> , ENE and WSW	H. M
Upon the Coast of Spain, and in Shetland, NE and SW. —	12 00	Without <i>Ufbant</i> , E and W	04 30
At <i>Scilly</i> , the Sound, <i>Scarborough</i> & at <i>Staples</i> NE by E & SW by W	03 00	St. <i>Vallery</i> , SSE. and NNW	06 00
At <i>Seven Isles</i> , without the Haven, in the broad Sound, E N E and W S W —	03 45	W	10 30
At the mouth of <i>Severn</i> between <i>Scilly</i> & the <i>Lirard</i> , at the <i>Spurn</i> & <i>Stockton</i> , E by N and W by S	04 30	At <i>Winchelsea</i> , N by E and S by W —	00 45
Without <i>Scilly</i> , in the Channel, and at <i>Salcomb</i> , E and W.	05 15	At the <i>Weilings</i> , and from the West end of the <i>Wight</i> , NNE and SSW —	01 30
At <i>Sedmouth</i> and at the <i>Start</i> , E by S and W by N —	06 00	Before the <i>Weilings</i> , NE by N and SW by S —	02 15
Off the <i>Start</i> in the Channel, ESE and WNW —	06 45	At <i>Whitby</i> , NE and SW —	03 00
Within the <i>Seyn</i> , and before <i>Shelbergh</i> , at 7 <i>Clifts</i> , SE & NW	07 30	In the Sea of <i>Wales</i> and <i>Severn</i> , ENE and WSW —	04 30
At <i>Sboram</i> , SE by S & NW by N	09 00	In <i>Wales</i> E by N and W by S	05 15
At <i>Seyn-head</i> , SSE & NNW	09 45	At <i>Wells</i> , at <i>Weymouth</i> , and at <i>Waterford</i> , East and West	06 00
T	10 30	At <i>Weymouth</i> Key, E by S. and W by N —	06 45
Within <i>Tervere</i> , N by E. and S by W —	00 45	At the <i>Nesß</i> , by <i>Wieringhen</i> , at <i>Winterton</i> , ESE. and WNW.	07 30
Before <i>Tervere</i> , before the River of <i>Thames</i> , and at <i>Tinmouth</i> , NNE. and SSW —	01 30	Thwart of the Isle of <i>Wight</i> , in the Channel, all within the Isle of <i>Wight</i> , between the Isle of <i>Wight</i> and <i>Beachy</i> , by the shore, SE by E. and NW by W	08 15
Before the <i>Tees</i> and <i>Tinmouth</i> , before the Bay of <i>Tinmouth</i> , NE and SW. —	03 00	At the East end of the <i>Wight</i> , and on <i>Wieringhen</i> Flats, SE. and N W. —	09 00
At the <i>Clifts</i> of the <i>Texel</i> , E N E and W S W —	04 30	Y	
In <i>Torbay</i> , and before the <i>Texel</i> , E and W —	06 00	Before <i>Yarmouth</i> , NNE and SSW —	01 30
In the Road of the <i>Texel</i> , ESE and WNW —	07 30	At <i>Youghall</i> , ENE. and W. SW —	04 30
At <i>Torgen</i> , SE by S and N W by N —	09 45	At <i>Yarmouth</i> , SE by E. and N W by W —	08 15
U		In <i>Yarmouth-Road</i> , in <i>Yarmouth-Haven</i> , SSE. and NNW	10 30
Before <i>Ureck</i> , N and S —	12 00	Z	
At <i>Ufe</i> , NE and SW —	03 00	On the Coast of <i>Zealand</i> , NNE and SSW —	01 30
Between <i>Ufbant</i> and the Main, NE by E and SW by W	03 45	In the <i>Zierick</i> Sea, NE & SW	03 00
		THE	

THE foregoing Table shews the Time of Full Sea at the several Places therein contained, upon the Full and Change Days of the Moon, which for more ready Use is put in Alphabetical Order.

Example. Admit the Time of Full Sea at *London*, upon the Full and Change Days required.

Look into the Table under the Letter (L) it is found to flow at *London* North East and South West; that is, when it is Full Sea at *London*, the Moon will be, as 'tis vulgarly said, upon the North East and South West Points of the Compass, which, as the Compass shews, is 3 Hours.

The Use of this, together with the Moon's Southing, to find the time of Full Sea at any Time, at any of the said Places shall be shewn below.

To find the Moon's Southing.

To find the Southing of the Moon, multiply the Moon's Age by 4, and divide the Product by 5, and the Quotient is the Time of Southing in Hours, and the Remainder is so many 12 min. of an Hour.

Note. If the Moon's Age exceed 15, reject the said 15, and take the Remainder, with which proceed instead of the Moon's Age, and it gives her Southing in the Morning.

Example. Suppose the Time of the Moon's Southing be required on the 25th of *November*, 1746. The Moon's Age is found to be 23 Days, rejecting 15, the Remainder is 8, which is multiplied by 4 makes 32, which divided by 5, gives the Quotient 6 Hours 24 Minutes, which is the Time of the Moon's Southing, as required.

I shall here add a Table of the Moon's Southing to every Day of her Age.

Moon's Age.	Time	
	H	M
1 — 16	0 —	48
2 — 17	1 —	36
3 — 18	2 —	24
4 — 19	3 —	12
5 — 20	4 —	00
6 — 21	4 —	48
7 — 22	5 —	36
8 — 23	6 —	24
9 — 24	7 —	12
10 — 25	8 —	00
11 — 26	8 —	48
12 — 27	9 —	36
13 — 28	10 —	24
14 — 29	11 —	12
15 — 30	12 —	00

The Use of the TABLE.

The first and second Column shews the Moon's Age, the third the Southing.

Example.

The Moon being 9 Days old, and her Southing required.

The first Column under the Title Moon's Age stands 9; over against it in the last Column is 7 Hours 12 Minutes, the Time of the Southing required.

Note also, the same Southing serves for 24 Days old, as serves for 9 Days, as the Table shews. Thus

The Use of the Tide-Table.

Thus having got the Moon's Southing, proceed to find the Time of Full Sea, as follows.

Suppose the Moon being 9 Days old, the Time of Full Sea in the *Downs* is required.

By the foregoing Table it appears that a N. N. W. and S. S. E. Moon makes full Sea, which as the said Table shews, is 10 hours 30 Minutes; to which adding the Moon's Southing at 9 Days old, (*viz.* 7 Hours 12 Minutes,) it makes 17 Hours 42 Minutes, or 5 Hours 42 Minutes, rejecting 12 Hours in the Morning.

But to be more exact use the following Table and Directions.

Moon's Age.		Time	
		H	M
1	16	0	43
2	17	1	20
3	18	1	52
4	19	2	22
5	20	2	52
6	21	3	26
7	22	4	7
8	23	4	55
9	24	5	50
10	25	6	53
11	26	7	59
12	27	9	4
13	28	10	8
14	29	11	5
15	30	00	0

Having found the Time of Full Sea, upon the Full and Change Days, by the preceding Table for that Purpose, enter this Table with the Moon's Age; against which in the last Column are the Hours and Minutes to be added for the Time of Full Sea desired.

Example.

Suppose as before, the Moon being 9 Days old, and the Time of Full Sea in the *Downs* is required.

A NNW. and SSE. Moon makes Full Sea upon the Full and Change Days, which is 10 hours 30 min. which being found, enter this Table with the Moon's Age 9 Days, against which stand 5 hours 50 min. which added to 10 hours 30 min. makes 16 hours 20 min. or 4 hours 20 min. (rejecting 12 hours) in the Morning.

Here follows

A New and Exact KALENDAR O F

The Golden Number, Epact and Moveable Feasts, as also of the Sun's Place and Declination to every Day of the Year, for the First, Second, Third, and Leap-Years, newly calculated and made to serve (without any sensible Error) till the Year 1760. Likewise the Sun's Rising, whereby may be found the Time of the Setting, and Length of the Day and Night; together with the Southing of the Principal Fixed Stars at Midnight.

A Table of the Dominical Letters, Cycle of the Sun, Prime, Epact, and Moveable Feasts, for 26 Years to come.

Years.	Dom. Letter	Cycle of ☉	Prime	Epact.	Shrove-Sunday.	Easter-Sunday.	Whit-Sunday.
1745	F	18	17	7	February 24	April 14	June 2
1746	E	19	18	18	9	March 30	May 18
1747	D	20	19	29	March 1	April 19	June 7
1748	CB	21	1	11	February 21	April 10	May 29
1749	A	22	2	22	5	March 26	14
1750	G	23	3	3	25	April 15	June 3
1751	F	24	4	14	17	7	May 26
1752	ED	25	5	25	9	March 29	17
1753	C	26	6	6	February 21	April 11	May 30
1754	B	27	7	17	13	3	May 22
1755	A	28	8	28	March 5	23	June 11
1756	GF	01	9	9	February 25	14	June 2
1757	E	02	10	20	9	March 30	May 18
1758	D	03	11	1	March 1	April 19	June 7
1759	C	04	12	12	February 21	11	May 30
1760	BA	05	13	23	6	March 26	14
1761	G	06	14	4	February 25	April 15	June 3
1762	F	07	15	15	17	7	May 26
1763	E	08	16	26	2	March 23	11
1764	DC	09	17	7	22	April 11	30
1765	B	10	18	18	13	3	22
1766	A	11	19	29	March 5	23	June 11
1767	G	12	1	11	February 18	8	May 27
1768	FE	13	2	22	10	March 30	18
1769	D	14	3	3	March 1	April 19	June 7
1770	C	15	4	14	February 14	4	May 23

Jan.

Month Days	Week Days	Remarkable days, and four-thing of Stars at Midnight.	First		Year Second		Year Third		Year Leap		Year	
			1745	1749	1746	1750	1747	1751	1748	1752	1753	1760
			1753	1757	1754	1758	1755	1759	1756		1760	
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M	D M	D M
			vp	South	vp	South	vs	South	vs	South		South
1	W	Circumcision	22 31	21 36	22 16	21 39	22 01	21 41	21 47	21 43		
2	T	Sun r. 8. o.	23 32	21 26	23 17	21 29	23 02	21 31	22 48	21 33		
3	W		24 33	21 15	24 18	21 18	24 04	21 21	23 49	21 23		
4	T		25 34	21 04	25 19	21 07	25 05	21 10	24 50	21 12		
5	F		26 35	20 53	26 21	20 56	26 06	20 58	25 51	21 01		
6	S	Epiphany	27 37	20 41	27 22	20 44	27 07	20 47	26 52	20 49		
7	S		28 38	20 29	28 23	20 32	28 08	20 35	27 53	20 38		
8	M		29 39	20 16	29 24	20 19	29 09	20 22	28 54	20 25		
9	T	Col in Aqua	☾ 40	20 03	☾ 25	20 06	☾ 10	20 10	29 55	20 13		
10	W		01 41	19 50	01 26	19 53	01 11	19 56	☾ 56	20 00		
11	T		02 42	19 36	02 27	19 39	02 12	19 43	01 57	19 46		
12	F		03 43	19 22	03 28	19 25	03 13	19 29	02 58	19 32		
13	S	Sun r. 7. 41.	04 44	19 08	04 29	19 11	04 14	19 15	03 59	19 18		
14	S		05 45	18 53	05 30	18 56	05 15	19 00	05 00	19 03		
15	M		06 46	18 38	06 31	18 41	06 16	18 45	06 01	18 49		
16	T		07 47	18 22	07 32	18 26	07 17	18 30	07 02	18 33		
17	F		08 47	18 06	08 33	18 10	08 18	18 14	08 03	18 18		
18	S		09 48	17 49	09 34	17 54	09 19	17 58	09 04	18 02		
19	S		10 49	17 34	10 34	17 38	10 20	17 42	10 05	17 46		
20	M		11 50	17 17	11 35	17 21	11 21	17 25	11 06	17 29		
21	T	Sun r. 7. 30	12 51	17 00	12 36	17 04	12 21	17 08	12 07	17 12		
22	F		13 52	16 42	13 37	16 47	13 22	16 51	13 07	16 55		
23	S		14 52	16 25	14 38	16 29	14 23	16 33	14 08	16 38		
24	S		15 53	16 07	15 39	16 11	15 24	16 16	15 09	16 20		
25	M	Conv. St. Paul	16 54	15 49	16 39	15 53	16 25	15 57	16 10	16 02		
26	T		17 55	15 30	17 40	15 54	17 25	15 39	17 11	15 44		
27	F		18 55	15 12	18 40	15 16	18 26	15 20	18 11	15 25		
28	S		19 56	14 53	19 41	14 57	19 27	15 02	19 12	15 06		
29	S		20 57	14 35	20 42	14 38	20 27	14 42	20 15	14 47		
30	M	K. Charles M	21 57	14 14	21 43	14 18	21 28	14 23	21 15	14 28		
31	T		22 58	13 54	22 43	13 59	22 29	14 03	22 14	14 08		

February hath XXVIII Days.

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Month	Week	Days	Remarkable days, and something of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year		Year								
				1745	1749	1746	1750	1747	1751	1748	1752									
				1753	1757	1754	1758	1755	1759	1756	1760									
				☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec							
				D M	D M	D M	D M	D M	D M	D M	D M	D M	D M							
				South		South		South		South		South								
1	D		Purit. Mary.	23	59	13	34	23	44	13	39	23	29	13	44	23	14	13	49	
2	E		Lyon's Heart.	24	59	13	14	24	44	13	19	24	30	13	23	24	15	13	28	
3	F			26	00	12	53	25	45	12	58	25	30	13	03	25	16	13	08	
4	G			27	00	12	33	26	46	12	38	26	31	12	43	26	16	12	48	
5	A		Lyon's Neck.	28	01	12	12	27	46	12	17	27	31	12	22	27	17	12	27	
6	B		Sun r. 7. 1.	29	01	11	51	28	46	11	56	28	32	12	01	28	17	12	06	
7	C		Sol in Pifces	☿	02	11	30	29	47	11	35	29	32	11	40	29	18	11	45	
8	D			☿	01	02	11	08	☿	47	11	13	☿	33	11	19	☿	18	11	24
9	E			02	02	10	47	01	48	10	52	01	33	10	57	01	18	11	02	
10	F			03	03	10	25	02	48	10	30	02	33	10	36	02	19	10	41	
11	G			04	03	10	03	03	48	10	09	03	34	10	14	03	19	10	19	
12	A			05	04	09	41	04	49	09	47	04	34	09	52	04	19	09	57	
13	B		Sun r. 6. 45.	06	04	09	19	05	49	09	24	05	34	09	30	05	20	09	35	
14	C		Valentine	07	04	08	57	06	49	09	02	06	35	09	08	06	20	09	13	
15	D		Lower of the	08	04	08	34	07	49	08	40	07	35	08	45	07	20	08	51	
16	E		two foremoit	09	04	08	12	08	49	08	17	08	35	08	23	08	20	08	28	
17	F		in ☐ of great																	
17	G		Bear.	10	04	07	49	09	50	07	55	09	35	08	00	09	20	08	06	
18	A			11	04	07	26	10	50	07	32	10	35	07	37	10	21	07	43	
19	B			12	04	07	03	11	50	07	09	11	35	07	15	11	21	07	20	
20	C			13	04	06	40	12	50	06	46	12	35	06	52	12	21	06	57	
21	D		Sun r. 6. 29.	14	04	06	17	13	50	06	23	13	35	06	29	13	21	06	34	
22	E			15	04	05	54	14	50	06	00	14	35	06	05	14	21	06	11	
23	F			16	04	05	31	15	50	05	57	15	35	05	42	15	21	05	48	
24	G		St. Matthias	17	04	05	08	16	50	05	13	16	35	05	19	16	21	05	25	
25	A			18	04	04	44	17	50	04	50	17	35	04	56	17	21	05	01	
26	B			19	04	04	21	18	49	04	27	18	35	04	32	18	20	04	38	
27	C			20	04	03	57	19	49	04	03	19	35	04	09	19	20	04	14	
28	D			21	04	03	34	20	49	03	39	20	35	03	45	20	20	03	51	
29	E			When it is Leap-year February hath 29 Days																
				F																

Month	Week Days	Remarkable days, and fourthing of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year		Year	
			1745 1753	1749 1757	1746 1754	1750 1758	1747 1755	1751 1759	1748 1756	1752 1760		
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M	D M	D M
			☿	South	☿	South	☿	South	☿	South	☿	South
1	David		22 03	03 01	21 49	03 16	21 34	03 22	22 20	03 04		
2	Lion's Tail		23 03	02 47	22 49	02 52	22 34	02 58	23 19	02 40		
3	Lower of two		24 03	02 23	23 48	02 28	23 34	02 34	24 19	02 16		
4	latter in ☐ of		25 01	01 59	24 48	02 05	24 33	02 11	25 19	01 53		
	Great Bear.											
5			26 02	01 31	25 48	01 41	25 33	01 47	26 18	01 29		
6			27 02	01 12	26 47	01 18	26 33	01 23	27 18	01 05		
7			28 01	00 48	27 47	01 54	27 32	01 00	28 17	00 42		
8			29 01	00 24	28 46	00 30	28 32	00 26	29 17	00 18		
9	Sun r. 6. o.		Y 00	00 01	29 46	00 06	29 31	00 12	Y 16	Nor. 05		
10			00 59	Nor. 23	Y 45	Nor. 17	Y 31	Nor. 12	01 16	00 29		
11	Upper of two		01 59	00 47	01 45	00 41	01 30	00 35	02 15	00 53		
12	latter in ☐ of		02 58	01 10	02 44	01 05	02 29	00 59	03 14	01 17		
	Great Bear.											
13			03 58	01 34	03 43	01 28	03 29	01 22	04 14	01 40		
14			04 57	01 57	04 42	01 52	04 28	01 46	05 13	02 04		
15			05 56	02 21	05 41	02 15	05 27	02 10	06 12	02 27		
16			06 55	02 44	06 41	02 39	06 27	02 33	07 12	02 51		
17	Sun r. 5. 14		07 55	03 08	07 40	03 02	07 26	02 56	08 11	03 14		
18			08 54	03 31	08 39	03 26	08 25	03 20	09 11	03 38		
19			09 53	03 55	09 39	03 49	09 24	03 43	10 09	04 01		
20			10 52	04 18	10 38	04 12	10 23	04 07	11 08	04 24		
21	Last but two		11 51	04 41	11 37	04 35	11 22	04 30	12 07	04 47		
22	in Great		12 50	05 04	12 36	04 58	12 21	04 53	13 06	05 10		
23	Bears Tail		13 44	05 27	13 35	05 21	13 20	05 16	14 05	05 33		
24	Sun r. 5. 30.		14 48	05 50	14 34	05 44	14 19	05 39	15 04	05 56		
25	Lady Day		15 47	06 13	15 33	06 07	15 18	06 02	16 03	06 19		
26			16 46	06 35	16 32	06 30	16 17	06 24	17 02	06 42		
27	Virgin Spike		17 45	06 38	17 30	06 52	17 16	06 47	18 01	07 04		
28			18 43	07 20	18 29	07 15	18 15	07 09	19 00	07 26		
29	Last but one		19 42	07 43	19 28	07 37	19 13	07 32	19 58	07 49		
30	in Great		20 41	08 05	20 27	07 59	20 13	07 54	20 57	08 11		
31	Bears Tail		21 40	08 23	21 26	08 22	21 11	08 16	21 56	08 33		

April hath XXX Days.

4 3

Month	Week Days	Remarkable days, and southing of Stars at Midnight	First Year		Second Year		Year		Third Year		Year		Leap Year		Year			
			1745	1749	1746	1750	1747	1751	1748	1752	1753	1757	1754	1758	1755	1759	1756	1760
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ plac	☉ dec								
			D	M	D	M	D	M	D	M	D	M	D	M	D	M		
			γ	North	γ	North	γ	North	γ	North	γ	North	γ	North	γ	North		
1	A	Sun r. 5. 16	22	38	08	49	22	24	08	43	22	10	08	38	22	54		
2	B		23	37	09	10	23	23	09	05	23	09	09	00	23	53		
3	C		24	36	09	32	24	21	09	27	24	07	09	22	24	51		
4	D	Left in Great Bear's Tail	25	34	09	54	25	20	09	48	25	06	09	43	25	50		
5	E		26	33	10	15	26	19	10	10	26	04	10	05	26	49		
6	F	Sun r. 5. 6.	27	31	10	36	27	17	10	31	27	03	10	26	27	47		
7	G		28	30	10	57	28	16	10	52	28	02	10	47	28	46		
8	H		29	28	11	18	29	14	11	13	29	00	11	08	29	44		
9	I		0	27	11	38	0	13	11	33	29	58	1	28	0	43		
10	J		01	25	11	59	01	11	11	54	0	57	1	49	01	41		
11	K	Dragon's Tail	02	24	12	19	02	09	12	14	01	55	12	09	02	39		
12	L	Arcturus	03	22	12	39	03	08	12	34	02	54	12	29	03	38		
13	M		04	20	12	59	04	06	12	54	03	52	12	49	04	37		
14	N		05	18	13	18	05	04	13	14	04	50	13	09	05	35		
15	O		06	17	13	38	06	03	13	33	05	48	13	28	06	33		
16	P	Sun r. 4. 48.	07	15	13	57	07	0	13	52	06	46	13	48	07	31		
17	Q		08	13	14	16	07	59	14	11	07	45	14	07	08	30		
18	R		09	11	14	34	08	57	14	30	08	43	14	25	09	27		
19	S		10	09	14	53	09	55	14	48	09	41	14	41	10	25		
20	T	Southernmost Scale in Libra	11	07	15	11	10	53	15	07	10	39	15	02	11	23		
21	U		12	06	15	29	11	51	15	25	11	37	15	20	12	20		
22	V	Sun r. 4. 37.	13	04	15	47	12	50	15	43	12	35	15	38	13	19		
23	W	St. George	14	02	16	04	13	48	16	00	13	33	15	56	14	17		
24	X		15	00	16	21	14	46	16	17	14	31	16	13	15	15		
25	Y	St. Mark Ev.	15	57	16	38	15	44	16	34	15	29	16	30	16	13		
26	Z	Upper of two	16	55	16	35	16	41	16	51	16	27	16	47	17	11		
27	A	foremost in	17	53	17	11	17	39	17	07	17	25	17	03	18	09		
28	B	of Little Bear	18	51	17	27	18	37	17	23	18	23	17	20	19	07		
29	C		19	49	17	43	19	35	17	39	19	21	17	35	20	05		
30	D	N. Scale of	20	47	17	59	20	34	17	55	20	19	17	51	21	03		

Month	Week	Days	Remarkable days, and four- thing of Stars at Midnight	First		Year		Second		Year		Third		Year		Leap		Year	
				1745	1753	1749	1757	1746	1754	1750	1758	1747	1755	1751	1759	1748	1756	1752	1760
				☉	pla	☉	dec	☉	pla	☉	dec	☉	pla	☉	dec	☉	plac	☉	dec
				D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
				♈	North	♈	North	♈	North	♈	N h	♈	North	♈	North	♈	North	♈	North
1	B		Phil. and Jac.	21	45	18	14	21	31	18	10	21	17	18	06	22	01	18	18
2	C		Sun r. 4. 21	22	43	18	29	22	29	18	25	22	15	18	21	22	58	18	33
3	D		Brightest in	23	40	18	43	23	26	18	40	23	12	18	36	23	56	18	47
4	E		the Crown.	24	38	18	57	24	24	18	54	24	10	18	50	24	54	19	01
5	F		Brightest in	25	36	19	11	25	22	19	08	25	08	19	05	25	52	19	15
6	G		Serpents neck	26	33	19	25	26	19	19	22	26	06	19	18	26	49	19	29
7	H			27	31	19	38	27	17	19	35	27	04	19	32	27	47	19	42
8	I			28	29	19	51	28	15	19	48	28	01	19	45	28	45	19	55
9	J		Scorpions	29	26	20	04	29	12	20	01	28	59	19	58	29	42	20	07
10	K		Forehead.	II	24	20	16	II	10	20	13	29	56	20	10	II	40	20	19
11	L		Sun r. 4. 8.	01	22	20	28	01	08	20	25	II	53	20	22	01	37	20	31
12	M			02	19	20	40	02	05	20	37	01	51	20	34	02	35	20	43
13	N			03	17	20	51	03	03	20	48	02	49	20	45	03	32	20	54
14	O		Scorpions	04	14	21	02	04	00	20	59	03	46	20	56	04	30	21	05
15	P		Heart.	05	11	21	12	04	58	21	10	04	44	21	07	05	27	21	15
16	Q			06	09	21	22	05	55	21	20	05	41	21	17	06	25	21	25
17	R			07	08	21	32	06	53	21	39	06	39	21	27	07	22	21	35
18	S			08	05	21	41	07	51	21	30	07	36	21	37	08	20	21	44
19	T			09	02	21	50	08	48	21	48	08	34	21	46	09	18	21	53
20	U		Sun r. 3. 57.	09	59	21	59	09	45	21	57	09	31	21	55	10	15	22	01
21	V			10	56	22	07	10	42	22	03	10	29	22	03	11	12	22	10
22	W			11	54	22	15	11	40	22	13	11	26	22	11	12	10	22	17
23	X			12	51	22	23	12	38	22	21	12	23	22	19	13	07	22	25
24	Y			13	49	22	30	13	35	22	28	13	21	22	26	14	05	22	32
25	Z			14	46	22	37	14	32	22	35	14	18	22	33	15	03	22	38
26	A			15	43	22	43	15	29	22	41	15	16	22	40	15	59	22	45
27	B			16	41	22	49	16	27	22	47	16	13	22	46	16	56	22	50
28	C			17	38	22	54	17	25	22	53	17	10	22	52	17	54	22	56
29	D		K.C.I.L.B.&R	18	35	22	59	18	22	22	58	18	07	22	57	18	51	23	01
30	E			19	32	23	04	19	19	23	03	19	05	23	02	19	48	23	05
31	F			20	29	23	08	20	16	23	07	20	02	23	06	20	45	23	10

June hath XXX Days.

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Month	Week Days	Remarkable days, and something of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year		Year	
			1745	1749	1746	1750	1747	1751	1748	1752		
			1753	1757	1754	1758	1755	1759	1756	1760		
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D M	D M	D M	D M	D M	D M	D M	D M	D M	D M
			II	North	II	North	II	North	II	North	II	North
1	S	Sun r. 3. 50.	21	27 23	12	21 13 23	11	20 59 23	10	21 57 23	14	22 40 23
2	M		22	24 23	16	22 10 23	15	21 57 23	14	22 40 23	17	23 37 23
3	T		23	21 23	19	23 08 23	18	22 54 23	17	23 37 23	20	24 34 23
4	W		24	19 23	22	24 05 23	21	23 51 23	20	24 34 23	23	25 31 23
5	T		25	16 23	24	25 02 23	23	24 48 23	23	25 32 23	26	26 29 23
6	W		26	13 23	26	25 59 23	25	25 46 23	25	26 29 23	28	27 26 23
7	T		27	10 23	27	26 57 23	27	26 43 23	26	27 26 23	28	28 23 23
8	W		28	08 23	28	27 54 23	28	27 40 23	28	28 23 23	29	29 21 23
9	T		29	05 23	29	28 51 23	29	28 37 23	29	29 21 23	30	30 18 23
10	W	Sun r. 2. 47.	30	02 23	29	29 48 23	29	29 34 23	29	30 18 23	31	31 15 23
11	T		01	59 23	29	30 45 23	29	30 31 23	29	31 15 23	32	32 12 23
12	W		02	56 23	28	01 43 23	28	01 29 23	28	32 12 23	33	33 09 23
13	T		03	54 23	27	02 40 23	27	02 26 23	28	33 09 23	34	34 07 23
14	W		04	51 23	26	03 37 23	26	03 23 23	26	34 07 23	35	35 04 23
15	T		05	48 23	24	04 34 23	24	04 20 23	25	35 04 23	36	36 01 23
16	W		06	45 23	21	05 31 23	22	05 18 23	23	36 01 23	37	37 08 23
17	T	Brightest in the Harp.	06	42 23	19	06 29 23	19	06 15 23	20	37 08 23	38	38 05 23
18	W		07	40 23	16	07 26 23	16	07 12 23	17	38 05 23	39	39 02 23
19	T		08	37 23	12	08 23 23	13	08 09 23	14	39 02 23	40	40 08 23
20	W		09	34 23	08	09 20 23	09	09 06 23	10	40 08 23	41	41 05 23
21	T	Sun r. 3. 50.	10	31 23	04	10 17 23	05	10 03 23	06	41 05 23	42	42 02 23
22	W		11	28 22	59	11 14 23	00	11 01 23	02	42 02 23	43	43 08 23
23	T		12	25 22	54	12 12 22	55	11 58 22	57	43 08 23	44	44 05 23
24	W	John Baptist	13	23 22	49	13 09 22	50	12 55 22	51	44 05 23	45	45 02 23
25	T		14	20 22	43	14 07 22	44	13 52 22	46	45 02 23	46	46 08 23
26	W		15	17 22	36	15 04 22	38	14 49 22	40	46 08 23	47	47 05 23
27	T		16	14 22	30	16 01 22	31	15 46 22	33	47 05 23	48	48 02 23
28	W		17	11 22	23	16 58 22	24	16 44 22	26	48 02 23	49	49 08 23
29	T	Peter Apostle	18	09 22	15	17 55 22	17	17 41 22	19	49 08 23	50	50 05 23
30	W		19	06 22	07	18 52 22	09	18 38 22	11	50 05 23	51	51 02 23

Month	Week	Days	Remarkable days, and four- thing of Stars at Midnight.	First		Year		Second		Year		Third		Year		Leap		Year	
				1745	1749	1746	1750	1747	1751	1748	1752	1745	1749	1746	1750	1747	1751	1748	1752
				1753	1757	1754	1758	1755	1759	1756	1760	1753	1757	1754	1758	1755	1759	1756	1760
				☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
				D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
				☿	North	♄	North	♅	North	♆	North	♇	North	♈	North	♉	North	♊	North
1	☿		Sun r. 3. 57.	20	03	21	59	19	49	22	01	19	35	22	03	20	19	21	57
2	☿			21	00	21	51	20	46	21	53	20	33	21	55	21	16	21	48
3	☿			21	57	21	42	21	44	21	44	21	31	21	46	22	13	21	39
4	☿			22	55	21	32	22	41	21	35	22	27	21	37	23	11	21	30
5	♈		Brightest be-	23	52	21	22	23	38	21	25	23	24	21	27	24	08	21	20
6	♈		tween the	24	49	21	12	24	35	21	15	24	22	21	17	25	05	21	10
7	♈		Eagles should	25	46	21	52	25	33	21	05	25	19	21	07	26	02	20	59
8	♈			26	44	20	01	26	30	20	54	26	16	20	56	26	59	20	48
9	♈			27	41	20	40	27	27	20	43	27	13	20	45	27	57	20	37
10	♈			28	38	20	29	28	24	20	31	28	11	20	34	28	54	20	25
11	♈		Sun r. 4. 8.	29	36	20	17	29	22	20	20	29	08	20	23	29	5	20	13
12	♈			☿	33	20	04	☿	19	20	07	☿	05	20	11	☿	49	20	01
13	♈			01	30	19	52	01	16	19	55	01	03	19	58	01	46	19	48
14	♈			02	28	19	39	02	14	19	42	02	00	19	46	02	43	19	36
15	♈			03	25	19	26	03	11	19	29	02	57	19	33	03	41	19	22
16	♈		Sun r. 4. 16.	04	22	19	12	04	08	19	16	03	55	19	19	04	38	19	09
17	♈			05	20	18	59	05	06	19	02	04	52	19	05	05	36	18	55
18	♈		Swan's Tail	06	17	18	44	06	03	18	48	05	49	18	51	06	33	18	41
19	♈		Dog days beg	07	15	18	30	07	01	18	34	06	47	18	37	07	30	18	26
20	♈			08	12	18	15	07	58	18	19	07	44	18	22	08	28	18	11
21	♈		Sun r. 4. 23.	09	09	18	00	08	56	18	04	08	42	18	07	09	25	17	56
22	♈			10	07	17	45	09	53	17	49	09	39	17	52	10	23	17	41
23	♈			11	04	17	29	10	51	17	33	10	37	17	36	11	21	17	25
24	♈			12	02	17	13	11	48	17	17	11	34	17	21	12	18	17	09
25	♈		James Apottle	12	59	16	57	12	46	17	01	12	32	17	05	13	15	16	53
26	♈		Sun r. 4. 30.	13	57	16	41	13	43	16	45	13	29	16	49	14	13	16	36
27	♈			14	55	16	24	14	41	16	28	14	27	16	32	15	10	16	19
28	♈			15	52	16	07	15	38	16	11	15	24	16	15	16	08	16	02
29	♈			16	50	15	50	16	36	15	54	16	22	15	58	17	05	15	45
30	♈			17	47	15	32	17	33	15	36	17	19	15	41	18	03	15	27
31	♈			18	45	15	14	18	31	15	19	18	17	15	23	19	01	15	00

August hath XXXI Days.

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Month	Week Days	Remarkable days, and southing of Stars at Midnight	First Year 1745		Year 1749		Second Year 1746		Year 1750		Third Year 1747		Year 1751		Leap Year 1748		Year 1752	
			1753		1757		1754		1758		1755		1759		1756		1760	
			☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec		☉ pla		☉ dec	
			D	M	D	M	D	M	D	M	D	M	D	M	D	M	D	M
			☉ North		☉ North		☉ North		☉ North		☉ North		☉ North		☉ North		☉ North	
1	A	Lammas	19	42	14	56	19	29	15	01	9	14	15	05	19	58	14	51
2	B		20	40	14	38	20	26	14	43	10	1	14	47	20	56	14	35
3	C		21	32	14	20	21	24	14	24	21	10	14	29	21	54	4	15
4	D		22	36	14	01	22	22	14	05	22	08	14	10	22	52	13	56
5	E		23	34	13	42	23	20	13	47	23	06	13	51	23	49	13	37
6	F		24	31	13	23	24	17	13	27	24	04	13	32	24	47	13	17
7	G	Sun r. 4. 50.	25	29	13	05	25	15	13	08	25	01	13	13	25	45	12	58
8	A		26	27	12	44	26	13	12	49	25	59	12	53	26	43	12	38
9	B		27	25	12	24	27	11	12	29	26	57	12	34	27	41	12	19
10	C		28	23	12	04	28	09	12	09	27	55	12	14	28	38	11	59
11	D		29	21	11	44	29	07	11	49	28	52	11	54	29	36	11	38
12	E	Sol in Virgo	☿	18	11	24	☿	04	11	29	29	50	11	34	☿	34	11	18
13	F		01	16	11	03	01	02	11	08	☿	48	1	13	01	32	10	57
14	G		02	14	10	42	02	00	10	47	01	46	10	52	02	30	10	37
15	A		03	12	10	21	02	58	10	26	02	44	10	32	03	28	10	16
16	B	Sun r. 5. 8.	04	10	10	00	03	56	10	05	03	42	10	11	04	26	09	55
17	C		05	08	09	39	04	54	09	44	04	40	09	49	05	24	09	35
18	D		06	07	09	18	05	53	09	23	05	38	09	28	06	22	09	12
19	E		07	05	08	56	06	51	09	11	06	37	09	07	07	21	08	50
20	F		08	03	08	35	07	49	08	40	07	35	08	45	08	19	08	29
21	G	Fomelhaut	09	01	08	13	08	47	08	18	08	33	08	23	09	17	08	07
22	A	Sun r. 5. 19	09	59	07	51	09	45	07	56	09	31	08	02	10	15	07	45
23	B		10	57	07	29	10	43	07	34	10	29	07	40	11	13	07	23
24	C	Barthol. Ap.	11	56	07	07	11	41	07	12	11	27	07	17	12	12	07	01
25	D	First in Pega-	12	54	06	44	12	39	06	50	12	26	06	55	13	11	06	38
26	E	fur's Wing.	13	52	06	22	13	38	06	27	13	24	06	33	14	09	06	16
27	F	Sun r. 5. 29	14	51	05	59	14	37	06	05	14	22	06	10	15	07	05	53
28	G	Dog days end	15	49	05	37	15	35	05	42	15	21	05	48	16	05	05	31
29	A		16	47	05	14	16	33	05	20	16	19	05	25	17	03	05	08
30	B		17	46	04	51	17	32	04	57	17	18	05	02	18	02	04	45
31	C		18	45	04	28	18	30	04	34	18	16	05	40	19	00	04	22

Month	Week Days	Remarkable days, and southing of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year		Year							
			1745	1749	1746	1750	1747	1751	1748	1752								
			1753	1757	1754	1758	1755	1759	1756	1760								
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec								
			D	M	D	M	D	M	D	M	D	M						
			TR	N th	TR	North	TR	North	TR	North	TR	North						
1	A	Sun r 5. 38.	19	43	04	05	19	29	04	11	19	15	04	17	19	59	03	59
2	B	Lea. burnt 66	20	41	03	42	20	27	03	48	20	13	03	54	20	57	03	36
3	C		21	40	03	19	21	26	03	25	21	11	3	30	21	56	03	13
4	D		22	39	02	56	22	24	03	02	22	11	03	07	22	55	02	50
5	E		23	37	02	33	23	23	02	39	23	09	02	44	23	54	02	27
6	F		24	36	02	10	24	22	02	15	24	08	02	21	24	52	02	03
7	G		25	35	01	46	25	20	01	53	25	06	01	58	25	51	01	40
8	H		26	33	01	23	26	19	01	30	26	05	01	34	26	49	01	17
9	I		27	32	01	00	27	18	01	05	27	04	01	11	27	41	00	53
10	K		28	31	00	36	28	17	00	42	28	02	00	47	28	48	00	30
11	L	Androm. Head	29	30	00	13	29	16	00	18	29	01	00	24	29	46	00	06
12	M	Sun r. 6. o.	☿	29	Sou.	11	☿	14	Sou	05	☿	00	☿	01	☿	44	Sou	17
13	N		01	28	00	34	01	13	00	29	00	59	Sou.	23	01	44	00	41
14	O		02	27	00	58	02	12	00	52	01	58	00	46	02	43	01	04
15	P	End of Pega-	03	26	01	21	03	11	01	16	02	57	01	10	03	42	01	28
16	Q	us Wing.	04	25	01	45	04	10	01	39	03	56	01	33	04	41	01	51
17	R		05	24	02	08	05	09	02	02	04	55	01	57	05	40	02	14
18	S		06	23	02	32	06	08	02	26	05	54	02	20	06	39	02	38
19	T		07	22	02	55	07	07	02	49	06	53	02	44	07	38	03	01
20	U	Sun r. 6. 16.	08	21	03	18	08	07	03	13	07	52	03	07	08	37	03	25
21	V	Matthew Ev.	09	20	03	42	09	06	03	36	08	51	03	30	09	36	03	48
22	W		10	19	04	05	10	05	03	59	09	51	03	54	10	35	04	11
23	X	Pole Star	11	19	04	28	11	04	04	23	10	50	04	17	11	35	04	35
24	Y		12	18	04	51	12	03	04	46	11	49	4	40	12	34	04	58
25	Z	Southernmost	13	17	05	15	13	03	05	09	12	48	05	03	13	33	05	21
26	A	in Andromeda's	14	17	05	39	14	02	05	32	13	48	05	26	14	33	05	44
27	B	Girdle.	15	16	06	01	15	01	05	55	14	47	05	49	15	32	06	07
28	C		16	15	06	24	16	01	06	18	15	47	06	12	16	32	06	30
29	D	Sun r. 6. 30.	17	15	06	46	17	00	06	41	16	46	06	35	17	31	06	53
30	E		18	14	07	09	18	00	07	04	17	45	06	58	18	30	07	15

October hath XXXI Days.

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Month	Week Days	Remarkable days, and fou-thing of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year	
			1745	1749	1746	1750	1747	1751	1748	1752
Days			1753		1754		1755		1756	
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec
			D	M	D	M	D	M	D	M
			South		South		South		South	
1	A	Sun r. 6. 38.	19	14	07	32	18	59	07	26
2	B		20	13	07	54	19	59	07	49
3	C		21	13	08	17	20	58	08	11
4	D		22	13	08	39	21	58	08	34
5	E		23	12	09	01	22	58	08	56
6	F		24	12	09	23	23	57	09	18
7	G		25	12	09	45	24	57	09	40
8	A		26	11	10	07	25	57	10	02
9	B		27	11	10	29	26	57	10	23
10	C	Andromeda's	28	11	10	50	27	57	10	45
11	D	Southernmost	29	11	11	12	28	56	11	06
12	E	Foot.	30	11	11	33	29	56	11	28
13	F	Sun r. 7. 4.	01	11	11	54	30	56	11	49
14	G		02	11	12	14	01	56	12	09
15	A		03	11	12	35	02	56	12	30
16	B		04	11	12	56	03	56	12	51
17	C		05	11	13	16	04	56	13	11
18	D	Luke Evan.	06	11	13	36	05	56	13	31
19	E		07	11	13	56	06	57	13	51
20	F		08	11	14	15	07	57	14	10
21	G		09	11	14	34	08	57	14	30
22	A		10	12	14	53	09	57	14	49
23	B		11	12	15	12	10	57	15	08
24	C		12	12	15	31	11	57	15	26
25	D	Sun r. 7. 24	12	12	15	49	12	58	15	45
26	E		13	13	16	07	13	58	16	03
27	F		14	13	16	25	14	58	16	21
28	G	Simon & Jude	15	13	16	43	15	59	16	38
29	A		17	14	17	00	16	59	16	56
30	B		18	14	17	17	18	00	17	13
31	C	Sun r. 7. 33	19	15	17	34	19	00	17	30

Month Days	Week Days	Remarkable days, and southing of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year		Year							
			1745	1749	1746	1750	1747	1751	1748	1752								
			1753	1757	1754	1758	1755	1759	1756	1760								
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec						
			D M	D M	D M	D M	D M	D M	D M	D M	D M	D M						
			μ	South	μ	South	μ	South	μ	South	μ	South						
1	D	All Saints	20	15	17	50	20	01	17	46	19	46	17	42	20	32	17	54
2	F	Sun r. 7. 36.	21	16	18	06	21	01	18	02	20	46	17	58	21	32	18	10
3	T		22	16	18	22	22	02	18	18	21	47	18	14	22	33	18	26
4	W	K. Wil. Nar.	23	17	18	37	23	02	18	33	22	47	18	30	23	33	18	41
5	T		24	17	18	52	24	03	18	49	23	48	18	45	24	34	18	56
6	W	Powder Plot	25	18	19	07	25	03	19	03	24	49	19	00	25	35	19	11
7	T		26	19	19	21	26	04	19	18	25	49	9	14	26	35	19	25
8	W		27	19	19	35	27	05	19	32	26	50	19	29	27	36	19	39
9	T		28	20	19	49	28	05	19	46	27	51	19	42	28	37	19	53
10	W		29	21	20	03	29	06	19	59	28	51	19	56	29	37	20	06
11	T	Martin B.	2	22	20	15	2	07	20	12	29	52	20	09	2	38	20	19
12	W		01	22	20	28	01	08	20	25	2	53	20	22	01	39	20	31
13	T	Sun r. 7. 53.	02	23	20	40	02	08	20	37	01	54	20	34	02	40	20	43
14	W		03	24	20	52	03	09	20	49	02	54	20	46	03	40	20	55
15	T		04	25	21	03	04	10	21	01	03	55	20	58	04	41	21	06
16	W	Aldebaran.	05	26	21	15	05	11	21	12	04	56	21	09	05	42	21	17
17	T		06	26	21	25	06	12	21	23	05	57	21	20	06	43	21	28
18	W		07	27	21	36	07	13	21	33	06	58	21	33	07	44	21	38
19	T		08	28	21	45	08	13	21	43	07	59	21	40	08	45	21	48
20	W		09	29	21	55	09	14	21	52	09	00	21	50	09	46	21	57
21	T		10	30	22	04	10	15	22	01	10	01	21	59	10	47	22	06
22	W		11	31	22	12	11	16	22	10	11	01	22	08	11	48	22	14
23	T		12	32	22	20	12	17	22	18	12	02	22	16	12	49	22	22
24	W	Sun r. 5. 58.	13	33	22	28	13	18	22	26	13	03	22	24	13	50	22	30
25	T	Capella, or	14	34	22	35	14	19	22	33	14	04	22	32	14	51	22	37
26	W	the Goat	15	35	22	42	15	20	22	40	15	05	22	39	15	52	22	44
27	T	Orion's Left-	16	36	22	48	16	21	22	47	16	05	22	45	16	53	22	50
28	W	Foot.	17	37	22	54	17	22	22	53	17	08	22	51	17	54	22	56
29	T	Bull's Horn	18	38	23	00	18	23	22	58	18	09	22	57	18	55	23	01
30	W	Andrew Ap.	19	39	23	05	19	24	23	05	19	10	23	02	19	56	23	06

December hath XXXI Days.

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Month	Week Days	Remarkable days, and sou-thing of Stars at Midnight.	First Year		Second Year		Third Year		Leap Year		Year							
			1745	1749	1746	1750	1747	1751	1748	1752								
			1753	1757	1754	1758	1755	1759	1756	1760								
			☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec	☉ pla	☉ dec						
			D	M	D	M	D	M	D	M	D	M						
			♂	South	♂	South	♂	South	♂	South	♂	South						
1	F	First in Ori-	20	40	23	09	20	26	23	08	20	11	23	07	20	57	23	10
2	S	on's Belt	21	41	23	13	21	27	23	12	21	12	23	11	21	58	23	14
3	M	Last in Orion's	22	43	23	17	22	28	23	16	22	13	23	15	22	59	23	18
4	T	Belt.	23	44	23	20	23	29	23	19	23	14	23	18	24	00	23	21
5	F	Orion's right	24	45	23	23	24	30	23	22	24	15	23	21	25	02	23	23
6	S	Shoulder, and	25	46	23	25	25	31	3	24	25	16	23	24	26	03	23	25
7	M	Auriga's right	26	47	23	27	26	32	23	26	16	17	23	26	27	04	23	27
8	T	Shoulder.	27	48	23	28	27	33	23	28	27	19	23	27	28	05	23	28
9	F		28	50	23	29	28	35	23	28	28	20	23	28	29	06	23	29
10	S		29	51	23	29	29	36	23	29	29	21	23	29	VS	07	23	29
11	M	Shortest Day	Yp	52	23	29	Yp	37	23	29	Yp	22	23	29	01	08	23	29
12	T		01	53	23	28	01	38	23	28	01	23	23	29	02	09	23	28
13	F	Foot of the	02	54	23	27	02	39	23	27	02	24	23	28	03	11	23	27
14	S	Great Dog.	03	55	23	26	03	40	23	26	03	25	23	26	04	12	23	25
15	M	Bright Star	04	57	23	24	04	42	23	24	04	27	23	25	05	13	23	23
16	T	of Gemini.	05	58	23	21	05	43	23	22	05	28	23	22	06	14	23	20
17	F	Sun r. 8. 11.	06	59	23	18	06	44	23	19	06	29	23	19	07	15	23	17
18	S	Mouth of the	08	00	23	15	07	45	23	15	07	30	23	16	08	17	23	14
19	M	Great Dog, or	09	01	23	11	08	46	23	12	08	31	23	13	09	18	23	10
20	T	Syrus.	10	02	23	07	09	47	23	07	09	33	23	08	10	19	23	05
21	F	Thomas Ap.	11	03	23	02	10	49	23	03	10	34	23	04	11	20	23	00
22	S		12	05	22	56	11	50	22	57	11	35	22	59	12	21	22	55
23	M	Sun r. 8. 8.	13	06	22	51	12	51	22	52	12	36	22	53	13	22	22	49
24	T		14	07	22	44	13	52	22	46	13	37	22	47	14	24	22	42
25	F	Nat. Christ.	15	08	22	38	14	53	22	39	14	38	22	41	15	25	22	36
26	S	St. Steven.	16	09	22	31	15	54	22	32	15	40	22	34	16	26	22	28
27	M	John Evan.	17	10	22	28	16	56	22	25	16	4	22	27	17	27	22	21
28	T	Innocents.	18	12	22	15	17	57	22	19	17	42	22	19	18	28	22	15
29	F	Castor.	19	12	22	07	18	58	22	09	18	43	22	12	19	29	22	04
30	S	Pollux.	20	14	21	58	19	59	22	00	19	44	22	02	20	31	21	54
31	M	Sun r. 8. 1.	21	15	21	49	21	00	21	51	20	45	21	53	21	32	21	50

A Table of the Variation of the Sun's Declination to every 15
Degrees of Longitude from the Meridian of London.

Degrees of Longitude from the Meridian of London.

Daily Variat	Deg 15	Deg 30	Deg 45	Deg 60	Deg 75	Deg 90	Deg 105	Deg 120	Deg 135	Deg 150	Deg 165	Deg 180
Min.	min	min	min	min	min	min	min	min	min	min	min	min
2	00	00	00	00	00	00	01	01	01	01	01	01
3	00	00	00	00	01	01	01	01	01	01	01	01
4	00	00	00	01	01	01	01	01	02	02	02	02
5	00	00	01	01	01	01	01	02	02	02	02	02
6	00	00	01	01	01	01	02	02	02	02	03	03
7	00	01	01	01	01	02	02	03	03	02	03	03
8	00	01	01	01	02	02	02	03	03	03	04	04
9	00	01	01	01	02	02	03	03	03	04	04	04
10	00	01	01	02	02	02	03	03	04	04	05	05
11	00	01	01	02	02	03	03	04	04	05	05	05
12	00	01	01	02	02	03	03	04	04	05	05	06
13	01	01	02	02	03	03	04	04	05	05	06	06
14	01	01	02	02	03	03	04	05	05	06	06	07
15	01	01	02	02	03	04	04	05	06	06	07	07
16	01	01	02	03	03	04	05	05	06	07	07	08
17	01	01	02	03	04	04	05	06	06	07	08	08
18	01	01	02	03	04	04	05	06	07	07	08	09
19	01	02	02	03	04	05	06	06	07	08	09	09
20	01	02	02	03	04	05	06	07	07	08	09	10
21	01	02	03	03	04	05	06	07	08	09	10	10
22	01	02	03	04	05	05	06	07	08	09	10	11
23	01	02	03	04	05	06	07	08	09	10	11	11
24	01	02	03	04	05	06	07	08	09	10	11	12

IN every Page there is 11 Columns, the first shews the Day of the Month, the second the Day of the Week, expressed by the Letters A, B, C, &c. the third the Southing of several Stars at Midnight, at which time the said Stars are to be observed, thereby to find the Latitude; in the same Column is given the time of Sun-rising (and by subtracting the time of rising from 12 Hours, gives the time of setting) the eight following Columns shew the Sun's Place and Declination for the First, Second, Third, and Leap-year, according to their respective Titles.

For the more ready knowing of Leap-year, the following Table is inserted, where it is found by Inspection, as also follow the First, Second, or Third Years after Leap-year.

First Year	Second Year	Third Year	Leap-Year
1745	1746	1747	1748
1749	1750	1751	1752
1753	1754	1755	1756
1757	1758	1759	1760
1761	1762	1763	1764
1765	1766	1767	1768
1769	1770	1771	1772
1773	1774	1775	1776

The Use of the Kalendar.

To find the Day of the Week, Month, or for any Time past, or to come, by the Kalendar.

First, Find the Dominical Letter for the Year, then proceed as follows.

Example 1. Suppose it were required to find what Day of the Month will be the third *Wednesday* in *March*, 1746.

Having found the Dominical Letter by the Directions in Page 22, or by the Table in Page 39, to be E, turn to the Month of *March*, and account E for *Sunday*, then the Letter A is for *Wednesday*, and the third *Wednesday* is the 19th of *March*, which was required.

Example 2. What Day of the Week will the second of *September* be on in the Year 1748.

This Year being Leap-year has two Dominical Letters, C and B; the first Letter, to wit C, serving from the first of *January* to the end of *February*; the last Letter, to wit B, serves from thence to the Years end.

Wherefore looking against the second of *September*, there stands G, which represents *Friday*, the Day of the Week required.

Note, That the *Gregorian* or *Foreign* Account, being 11 Days before ours; so that our first of *January* is their 12th; our 12th their 23d; our 23d their 3d of *February*; our 24th of *February* is their 7th of *March*: But in Leap-year our 24th of *February* is their 6th of *March*; because then *February* hath 29 Days.

To

The Explanation of the Kalendar, and Use

To find the Sun's Place and Declination by the Kalendar.

Example 1. Suppose the Sun's Place and Declination be required on the 10th of *January* 1745, being the first after Leap-year.

In the Month of *January*, in the first Column look the Day of the Month, over-against which, under the First Year stands 1.41, that is, the Sun's Place is in 1 deg. 41 min. of *Aquarius*: In the next Column under the said Year stands 19.51, under the Title South, which shews the Declination to be 19 deg. 51 min. Southerly; and this serves for the Year 1745; on the said 10th of *January*, being the first after Leap-year.

Example 2. Suppose the Sun's Place and Declination to be required on the 10th of *March*, 1748, being Leap-year.

In the Month of *March*, in the first Column find the Day of the Month, over-against which, under Leap-year, stands 1.16, which shews the Sun's Place to be in 1 deg. 16 min. in *Aries*; and in the next Column under Leap-year stands 00.29, which shews the Declination to be 29 min. Northerly, which was required.

Although it is common to take the Declination as it is in the Kalendar, yet if the Difference of Longitude be considerable from *London*, it is requisite the Declination should be corrected, because in the Kalendar it is calculated for the Meridian of *London*, for which End the *Table of the Variation of the Sun's Declination to every 15 Degrees of Longitude from the Meridian of London*, immediately following the Kalendar, is added; the Use and Explanation whereof follows.

IN the first Column is the daily Variation, which is found by subtracting the Declination of the given Day of the Month, from the Declination for the Day following; or contrarily this from that, that is, the lesser from the greater, and the Difference is the daily Variation. In the Head of the other Columns are Degrees of Longitude from *London*, either Easterly or Westerly, and in those Columns under the respective deg. of Longitude, are the Minutes of Declination, answerable to the daily Variation. As suppose the daily Variation was 10 min. and the Difference of Longitude 90 deg. against 10 in the first Column, and under 90 deg. at the Head of the Table, stands 2 Minutes, which answer thereto, and are to be used as follows.

The Use of the Table of the Variation of the Sun's Declination.

The Rule. First, If the Difference of Longitude be Westerly, and the Declination increasing, the Variation found in this Table must be added to the Declination found in the Kalendar; but if the Declination be decreasing, it must be subtracted therefrom.

Secondly, If the Difference of Longitude be Easterly, and the Declination increasing, the Variation aforesaid must be subtracted; but the Declination decreasing must be added.

Example 1. *April* the 19th, 1748, being at Sea, the Difference of Longitude from the Meridian of *London* 90 degrees Westerly, I find the Declination

Declination in the Kalendar to be 14 deg. 58 min. North ; and the 20th Day, the Declination is 15 deg. 16 min. therefore subtracting the lesser Declination from the greater, the Remainder is 18 min. which is the daily increase. Then in the Table under 90 deg. and over-against 18, stands 4 min. which (because the Difference of Longitude is Westerly, and the Declination increasing) must be added to 14 deg. 58 min. before found, which makes the true Declination 15 deg. 02 min. North.

If the Difference of Longitude in this Case had been Easterly, the 4 min. found in the Table must have been subtracted.

Note, It is easily discerned, whether the Declination increase or decrease, by observing whether the Declination for the Day following be greater or lesser ; for if it be greater, then it increases ; but if less, then it decreases.

Example 2. *January* the 10th 1745, being at Sea, the Difference of Longitude from *Landon* 120 deg. Westerly, I find the Declination in the Kalendar to be 19 deg. 50 min. South, and the 11th Day it is 19 deg. 36 min. therefore subtracting the lesser from the greater the Difference is 14 min. which is the daily decrease ; then in this Table under 120 deg. and against 14 stands 5 min. (which because the Difference of Longitude is Westerly, and the Declination decreasing) must be subtracted, which makes the true Declination 19 deg. 45 min. South. If the Difference of Longitude had been Easterly, the 5 min. must have been added.

The Use of the Sun's Declination to find the Latitude.

The Declination of the Sun is the most useful at Sea, with the Complement of the Sun's Meridian Altitude (commonly called the Zenith Distance) taken with a Quadrant or Cross-staff, to find the Latitude of the Place ; for which take the following Rules.

Rule 1. If the Sun comes to the Meridian in the South, and the Declination be North, then the Declination added to the Complement of the Meridian Altitude is the Latitude North.

Example. Suppose being at Sea, the 10th of *April*, 1748, the Declination found by the Table is 12 deg. 04 min. North, the Sun comes to the Meridian in the South ; the Complement of the Meridian Altitude by Observation is 23 deg. 10 min. What is the Latitude ?

Complement of the Meridian Altitude is — 23° 10' South

Declination of the Sun is ————— 12 04 North

The Latitude of the Place is ————— 35 14 North

Rule 2. If the Sun comes to the Meridian in the North and hath North Declination, then subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude North. But if the Complement of the Altitude exceed the Declination, subtract the Declination therefrom, and the Remainder is the Latitude South.

Example 1. Suppose being at Sea, *May* 20, 1748, the Declination being 22 deg. 01 min. North, the Sun comes to the Meridian in the North, and by observing with a Quadrant the Sun's Zenith Distance is 18 deg. 42 min. What is the Latitude of the Place ?

56 *The Use of the Table of the Sun's Declination.*

Sun's Declination is _____ 22d. 01m. North
 The Sun's Zenith Distance _____ 18d. 42m. North
 The Latitude is _____ 3d. 19m. North

Example. 2. Suppose being at Sea, *June* 10th, 1745, the Sun's Declination by the Table is 23 deg. 29 min. North, the Complement of the Meridian Altitude, by Observation, is 33 deg. 10 min. the Sun comes to the Meridian in the North.

Complement of the Sun's Meridian Altitude is _____ 33d. 10m. North
 Sun's Declination _____ 23d. 29m. North
 The Latitude is _____ 9d. 41m. South

Rule 3. If the Sun comes to the Meridian in the North, and hath South Declination, the Declination added to the Complement of the Altitude is the Latitude South.

Example 3. Suppose being at Sea, *January* 29th, 1748, the Sun comes to the Meridian in the North, the Complement of the Meridian Altitude is 22 deg. 10 min. What is the Latitude?

Complement of the Sun's Meridian Altitude is _____ 22° 10' North
 Sun's Declination by the Table _____ 14 47 South
 The Latitude is _____ 36 57 South

Rule 4. If the Sun comes to the Meridian in the South, and hath South Declination, subtract the Complement of the Meridian Altitude from the Declination, the Remainder is the Latitude South. But if the Complement of the Meridian Altitude exceed the Declination, subtract the Declination therefrom, the Remainder is the Latitude North.

Example 1. Suppose being at Sea, *January* 1st, 1748, the Sun cometh to the Meridian in the South: The Complement of the Altitude is 10 deg. 36 min. What is the Latitude?

Sun's Declination _____ 21° 43' South
 Complement of Meridian Altitude _____ 10 36 South
 Latitude of the Place _____ 11 07 South

Example 2. Suppose being at Sea, *February* 18, 1746, the Sun cometh to the Meridian in the South, the Complement of the Meridian Altitude is 25 deg. 20 min. What is the Latitude?

Complement of the Sun's Meridian Altitude _____ 25° 20' South
 Sun's Declination _____ 7 32 South
 Latitude _____ 17 48 North

Rule 5. If the Sun be in the Zenith (that is right over our Head) if it has either North or South Declination, the Declination is the Latitude either North or South.

Rule 6. If the Sun has no Declination, the Complement of the Meridian Altitude is the Latitude, which is North or South, according as the Ship is to the Northward or Southward of the Sun.

A

A Table of the Sun's Right Ascension.

57

Days	Jan.		February		March		April		May		June	
	☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	19	36	21	44	23	30	1	23	3	16	5	22
2	19	40	21	48	23	34	1	26	3	20	5	26
3	19	45	21	52	23	37	1	30	3	24	5	30
4	19	49	21	56	23	41	1	34	3	28	5	34
5	19	53	22	0	23	45	1	38	3	32	5	38
6	19	58	22	4	23	48	1	41	3	36	5	42
7	20	2	22	7	23	52	1	45	3	40	5	47
8	20	6	22	11	23	55	1	49	3	44	5	51
9	20	10	22	15	23	59	1	52	3	48	5	55
10	20	15	22	19	0	3	1	56	3	52	5	59
11	20	19	22	23	0	6	2	0	3	56	6	3
12	20	23	22	27	0	10	2	4	4	0	6	7
13	20	27	22	30	0	14	2	7	4	4	6	11
14	20	31	22	34	0	17	2	11	4	8	6	16
15	20	36	22	38	0	21	2	15	4	12	6	20
16	20	40	22	42	0	24	2	19	4	16	6	42
17	20	44	22	45	0	28	2	22	4	20	6	28
18	20	48	22	49	0	32	2	26	4	24	6	32
19	20	52	22	53	0	35	2	30	4	28	6	36
20	20	56	22	57	0	39	2	34	4	32	6	40
21	21	0	23	0	0	43	2	38	4	36	6	45
22	21	4	23	4	0	46	2	41	4	40	6	49
23	21	8	23	8	0	50	2	45	4	44	6	53
24	21	12	23	12	0	54	2	49	4	49	6	57
25	21	16	23	15	0	57	2	53	4	53	7	1
26	21	20	23	19	1	1	2	57	4	57	7	5
27	21	24	23	23	1	4	3	1	5	1	7	9
28	21	28	23	26	1	8	3	5	5	5	7	13
29	21	32			1	12	3	8	5	9	7	18
30	21	36			1	15	3	12	5	13	7	22
31	21	40			1	19			5	17		

H

A

A Table of the Sun's Right Ascension.

Days	July		August		Septem.		October		Novem.		Decemb.	
	☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.		☉ Right Ascen.	
	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.	h.	m.
1	7	26	9	28	11	21	13	10	15	10	17	18
2	7	30	9	31	11	25	13	14	15	14	17	23
3	7	34	9	35	11	28	13	17	15	18	17	27
4	7	38	9	39	11	32	13	21	15	22	17	31
5	7	42	9	43	11	36	13	25	15	27	17	36
6	7	46	9	46	11	39	13	29	15	31	17	40
7	7	50	9	50	11	43	13	32	15	35	17	45
8	7	54	9	54	11	46	13	36	15	39	17	49
9	7	58	9	58	11	50	13	40	15	43	17	54
10	8	2	10	1	11	54	13	44	15	47	17	58
11	8	6	10	5	11	57	13	48	15	52	18	3
12	8	10	10	9	12	2	13	51	15	56	18	7
13	8	14	10	12	12	4	13	55	16	0	18	11
14	8	18	10	16	12	8	13	59	16	4	18	16
15	8	22	10	20	12	12	14	3	16	9	18	20
16	8	26	10	23	12	15	14	7	16	13	18	25
17	8	30	10	27	12	19	14	11	16	17	18	29
18	8	34	10	31	12	22	14	14	16	21	18	34
19	8	38	10	34	12	26	14	18	16	26	18	38
20	8	42	10	38	12	30	14	22	16	30	18	42
21	8	46	10	42	12	33	14	26	16	34	18	47
22	8	49	10	45	12	37	14	30	16	39	18	51
23	8	53	10	49	12	41	14	34	16	43	18	56
24	8	57	10	52	12	44	14	38	16	47	19	0
25	9	1	10	56	12	48	14	42	16	52	19	5
26	9	5	11	0	12	52	14	46	16	56	19	9
27	9	9	11	3	12	55	14	50	17	1	19	13
28	9	13	11	7	12	59	14	54	17	5	19	18
29	9	16	11	10	13	3	14	58	17	9	19	22
30	9	20	11	14	13	6	15	2	17	13	19	26
31	9	24	11	18			15	6			19	31

A TABLE, shewing the Right Ascension, Declination, and Magnitude of the Principal fixed Stars.

Names of the Stars	Magnitude	Right Ascen.		Declination.	
		H.	M.	D.	M.
P O L E Star	2	0	32	87	51 N
Girdle of Andromeda	2	0	50	33	50 N
Bright Star Aries	2	1	48	22	9 N
Medusa's Head, Algeb	2	2	50	39	53 N
Bright Side of Perseus	2	3	5	48	52 N
Aldebaran, or Bull's Eye	1	4	20	15	55 N
Capella, or the Goat	1	4	56	45	41 N
Bright Foot of Orion, Regel	1	5	1	8	33 S
Middle Star in Orion's Belt	3	5	22	1	25 S
Orion's Right Shoulder	1	5	40	7	19 N
Auriga's Right Shoulder	2	5	44	44	53 N
Bright Foot of Gemini	2	6	19	16	38 N
Syrius, or the Great Dog	1	6	33	16	21 S
Castor, or Northermost Twin	2	7	17	32	27 N
Procyon, or the Little Dog	2	7	25	5	54 N
Pollux, or Southermost Twin	2	7	28	28	39 N
Hydra's Heart	1	9	14	7	29 S
Lyon's Heart, or Regulus	1	9	54	13	17 N
The Lower of the Pointers	2	10	45	57	50 N
The Upper of the Pointers	2	10	46	63	13 N
Lyon's Tail, Deneb	1	11	35	16	6 N
Upper of the two last in the Square of the Great Bear	2	12	2	58	35 N
Last but two in the Great Bear's Tail	2	12	40	57	28 N
Virgin's Spike	1	13	11	9	44 S
Last but one in the Great Bear's Tail	2	13	11	56	22 N
Last in the Great Bear's Tail	2	13	36	50	42 N
Arcturus	1	14	3	20	39 N
South Ballance	2	14	35	14	53 S
Foremost Guard	2	14	51	75	15 N
Brightest of the Crown	2	15	23	27	38 N
Brightest in the Serpent's Neck	2	15	31	7	18 N
Antares, the Scorpion's Heart	1	16	13	25	47 S
Head of Hercules	3	17	2	14	43 N
Opbincus, or Serpent's Head	3	17	22	12	47 N

H 2

Lyra

A Table of the Fixed Stars.

<i>Lyrae, or the Harp</i> _____	1	18	28	38	33	N
<i>Swan's Bill</i> _____	3	19	17	27	29	N
<i>Vulture, or Eagle's Heart</i> _____	2	19	37	8	10	N
<i>Swan's Tail</i> _____	2	20	30	44	19	N
<i>Mouth of Pegasus</i> _____	3	21	27	8	39	N
<i>Fomelbaut</i> _____	1	22	42	31	3	S
<i>Marchab, or Pegasus Wing</i> _____	2	22	51	13	44	N
<i>Scheat, or Pegasus's Leg</i> _____	2	22	50	26	36	N
<i>Cepheus's Knee</i> _____	3	23	20	76	7	N
<i>Andromeda's Head</i> _____	2	23	54	27	34	N
<i>End of Pegasus's Wing, Algenib</i> _____	2	23	59	13	39	N

The Explanation and Use of the TABLE of the Sun's Right Ascension, and of the Table of the Star's Right Ascension and Declination.

IN the Table of the Sun's Right Ascension, the first Page contains the first six Months of the Year; the next Page the other six Months; at the Head of the Table are the Months; in the first Column towards the Left-hand are the Days of the Month, and in the opposite Column is the Right Ascension in Hours and Minutes.

In the Table of the Fixed Stars, there are four Columns; in the first towards the Left hand, are the Names of the Stars; in the second, the Star's Magnitude; in the third, the Right Ascension in Hours and Minutes; in the fourth, their Declination in Degrees and Minutes, North or South.

First, To find the Time of a Star's coming upon the Meridian.

The Rule. Look the Right Ascension of the Sun and Star, and subtract the Right Ascension of the Sun from the Right Ascension of the Star, but if the Star's Right Ascension be less than the Sun's, add thereto 24 Hours, and then subtract; the Remainder after Subtraction, is the Time of the Star's coming upon the Meridian from Noon; but if the Remainder exceed 12 Hours, subtract 12 Hours therefrom, and then the Remainder is the Time from Midnight.

Example 1. Suppose the Time that *Fomelbaut* comes upon the Meridian on the 10th of *October* is required.

I find in the Table that Star's Right Ascension to be 22 Hours 42 min. and the Sun's to be 13 Hours 44 min. which subtracted from the Star's Right Ascension, leaves 8 Hours 58 min. the Time of the Star's coming upon the Meridian, Afternoon.

Example 2. Suppose the Time that the *Bull's Eye* comes upon the Meridian on the 15th of *October* was required.

I find the Star's Right Ascension to be 4 Hours 20 min. the Sun's 14 Hour's 3 min. Now because the Sun's Right Ascension is more than the Star's, add
to

to the Star's Right Ascension 24 Hours, which makes 28 Hours 20 min. from which subtracting the Sun's Right Ascension 14 Hours 3 min. there remains 14 Hours 17 min. from which subtracting 12 Hours, there remains 2 Hours 17 min. which is the Time of the Star's Southing after Midnight, as was required.

Secondly, The Time being given, to find what Star will come to the Meridian about the same Time?

The Rule. To the Sun's Right Ascension add the Time from Noon, at which the Star's coming to the Meridian is desired; the Sum is the Right Ascension of the Star that will come to the Meridian at that Time; with which enter the Table of the Star's Right Ascension and Declination, where look what Star's Right Ascension agrees with the Right Ascension before found, or nearest thereto, and that is the Star sought for.

Example. Suppose *March* the 27th, I desire to know what Star will come upon the Meridian about 8 at Night.

The Sun's Right Ascension is 1 Hour 4 Minutes; the Time from Noon is 8 Hours, which added to the Sun's Right Ascension, makes 9 Hours 4 Minutes: the nearest in the Table is *Hydra's Heart*, whose Right Ascension is 9 Hours 14 Minutes, and therefore Souths at 8 Hours 8 Minutes, and so in others.

Directions for Observations of the Stars, to find the Latitude of the Place.

Having before shewn how to find the Time of the Star's coming to the Meridian, I shall now shew by the Star's Altitude how to find the Latitude.

Note, In North Latitude, those Stars whose North Declination exceed the Complement of the Latitude may be observed under the Pole. And the same may be performed by the Southern Stars in South Latitude.

Directions for finding the Latitude, by the Meridian Altitude of the Fixed Stars.

Rule 1. If the Star comes to the Meridian in the South and hath North Declination, the Complement of the Altitude (by Observation) added to the Declination of the Star, found in the Table of the Star's Right Ascension and Declination, gives the Latitude North.

Example. On the 10th of *January*, being at Sea, I find by the foregoing Directions, that the *Lion's Heart* comes to the Meridian in the South at 1 Hour 39 min. after Midnight, the Meridian Altitude by Observation was 63 Degrees; which subtracted from 90 Degrees, there remains 27 Degrees the Complement of the Altitude; to which adding 13 Degrees 17 Minutes the Declination of the Star North, gives 40 Degrees 17 Minutes the Latitude of the Place North, which was required.

Rule 2. If a Star comes to the Meridian in the South, and hath South Declination, subtract the Declination from the Complement of the Altitude, and the Remainder is the Latitude North. But if the Declination exceed the

the Complement of the Altitude, subtract the Complement of the Altitude therefrom, and the Remainder is the Latitude South.

Example 1. Suppose on the 10th of *July*, being at Sea, the Star *Fomel-haut* cometh to the Meridian in the South, at 2 Hours 40m. after Midnight, the Merid. Alt. 35 deg. 50 min. the Compl. whereof is 54 deg. 10 min. the Star's Declination is 31 deg. 03 min. South, which subtracted from the Complement of Alt. leaves 23 deg. 7 min. which is the Latitude North.

Example 2. Suppose on the 20th of *June*, being at Sea, the *Scorpion's Heart* comes to the Meridian in the South at 9 Hours 33 min. at Night, the Complement of the Altitude is 5 deg. 27 min. the Declination 25 Degrees 47 minutes South, from which subtracting the Complement of the Altitude, there remains 20 deg. 20 min. which is the Latitude South.

Rule 3. If a Star comes to the Meridian in the North, above the Pole, and hath North Declination, subtracting the Declination from the Complement of the Altitude, the Remainder is the Latitude South. But if the Declination exceeds the Complement of the Altitude, subtract the Complement of the Altitude therefrom, the Remainder is the Latitude North.

Example 1. On the 11th of *June* the *brightest in the Harp* comes to the Meridian in the North at 25 minutes after Midnight, the Complement of the Altitude is 79 degrees, from which subtracting the Declination, which is 38 deg. 33 min. North, there remains 40 degrees 27 minutes, which is the Latitude South.

Example 2. On the 11th of *September Andromeda's Head* comes to the Meridian in the North at 11 Hours 57 Minutes at Night, the Complement of the Altitude is 7 deg. 10 min. which subtracted from the Declination 27 deg. 34 min. gives 20 deg. 24 min. which is the Latitude North.

Rule 4. If a Star comes to the Meridian in the North, and hath South Declination, the Complement of the Altitude added to the Declination gives the Latitude South.

Example. On the 12th of *December*, (*Syrius or the Great Dog's Mouth*) comes to the Meridian in the North at 26 minutes after Midnight, the Complement of the Altitude is 30 deg. to which adding 16 deg. 21 min. the Declination South, gives 46 deg. 21 min. the Latitude South.

Rule 5. If a Star comes to the Meridian, under the Pole, then add the Complement of the Declination to the Meridian Altitude, the Sum is the Latitude either North or South, according to the Star's Declination.

Example. On the 10th of *March*, the Pole Star comes to the Meridian under the Pole at 30 min. after Midnight, the Meridian Altitude 44 deg. 30 min. the Complement of the Declination 2 deg. 9 min. which added together gives 46 deg. 39 min. which is the Latitude North.

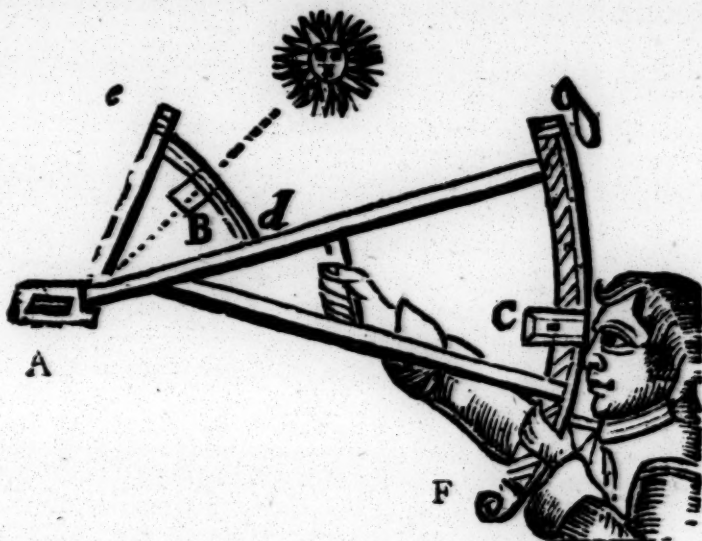
Rule 6. If the Star be in the Zenith, the Declination is the Latitude, either North or South, according to the Declination of the Star.

Rule 7. If the Star have no Declination, the Complement of the Meridian Altitude is the Latitude of the Place either North or South, according as the Star is either to the Northward or Southward.

The

The Description and Use of the Sea-Quadrant.

THIS Instrument consists of three Vanes and two Arches, the Horizon Vane, which in observing, respects the Horizon, as at A. The Shade Vane, so called because of its giving the Shadow upon the Horizon Vane in Time of Observation, as at B. Lastly, the Sight Vane, which in Time of Observation is placed at the Eye, through which the Shadow and Horizon are seen, as at C. The lesser of the Arches mark'd with *d e*, is called the *Sixty-Arch*, because it contains 60 (or more commonly of late 65) Degrees. In Time of Observation, the Shade Vane is placed upon this Arch always to an even Degree; it is numbred from the upper-end at *e*, downward to *d*, with 5, 10, 15, 20, &c. The bigger Arch marked with *g F*, is called the *Thirty-Arch*, because it contains 30 (or rather 25) Degrees it is divided into Degrees and Minutes.

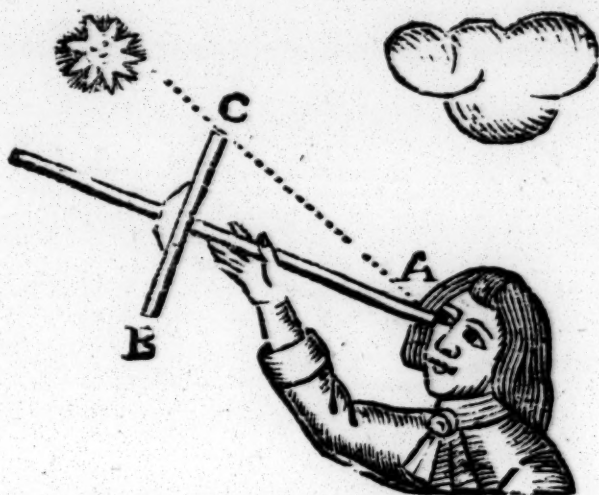


The Use of this Instrument is to take the Sun's Meridian Altitude, which is done in the manner following.

Put the Horizon Vane upon the End of the Quadrant at A, the Shade Vane upon the Sixty (or lesser Arch) to a Number of Degrees less than the Complement of the Altitude by 15 or 20. and the Sight Vane upon the Thirty Arch. The Vanes being thus fixed upon the Quadrant, your Back being turned towards the Sun, and the Sight Vane placed to the Eye, look thro' the said Sight Vane, and cause the Shadow of the upper Edge of the Shade Vane to fall upon the upper Part of the Slit in the Horizon Vane, where usually (for Perspicuity Sake) there is drawn a black Line; and if at the same Time the Horizon appear thro' the said Slit in the Horizon Vane, that is the Sun's present Altitude; but if the Sea appear instead of the Horizon, then slide the Sight Vane lower towards F; if the Sky appear instead of the Horizon, then slide the Sight Vane a little higher, until the Horizon appear through the Horizon Vane. But to obtain the Meridian Altitude

64 *The Use of the Quadrant, Fore-staff, and Nocturnal.*

Altitude, (which is the greatest Altitude the Sun will have that Day, and is the Thing used to find the Latitude,) continue observing, and as the Sun rises, the Sea will appear through the Horizon Vane; then must the Sight Vane be removed lower. And thus continue observing, as often as may be convenient till the Sun be at the highest, which is the Meridian Altitude. When the Sun begins to fall, the Sky will appear instead of the Horizon, and then it's Time to give over observing for that Day. Having thus done, add the Degrees upon the Sixty Arch to the Degrees and Minutes upon the Thirty Arch: and the Sum is the Complement of the Meridian Altitude; the Use of which for finding the Latitude, is sufficiently shewed in the preceding Rules.



The Description and Use of the Cross-staff, or Fore-staff.

THIS Instrument consists of a Staff and four Crosses, the first and shortest is called the Ten Cross, and it belongs to that Side of the Staff which is numbred from about 3 Degrees to 10 Degrees. Sometimes the Thirty Cross, and the rest of the Crosses are so made, as that the Breadth thereof serves instead of this Ten Cross.

The second Cross is called the Thirty Cross, and belongs to that Side of the Staff which is numbred from about 10 Degrees to 30.

The Third Cross is called the Sixty Cross, and belongs to that Side of the Staff which is numbred from about 20 to 60 Degrees.

The fourth and last Cross is called the Ninety Cross, and belongs to that Side of the Staff, which is numbred from about 30 to 90 Degrees.

This Staff is likewise numbred with the Complement to 90 Degrees, (*viz.*) at 10 stands 80, at 20 stands 70, at 30 stands 60; and so of the rest.

The Use of this Instrument is to take the Meridian Altitude of the Sun or Stars, which is done as followeth.

First,

First, Consider how great the Sun's Meridian Altitude will be that Day; and accordingly use the Cross most suitable (*viz.*) if the Meridian Altitude be judged to be under 10 deg. use the Tenth Cross; if between 10 and 30, the Thirty Cross; if between 30 and 60, the Sixty Cross; if between 60 and 90, the Ninety Cross, which is seldom used.

Having put on the Cross, place the flat end of the Staff at A, to the outside of the Eye, as near as may be, without hindring the Sight: Thus the Face being towards the Sun or Star hold the Cross upright; then look at the upper End of the Cross at C for the Sun or Star, and at the lower End at B for the Horizon, and if the Sea appear instead of the Horizon, remove the Cross a little further from the Eye; but if the Sky appears instead of the Horizon, remove the Cross a little nearer to the Eye, until the Sun or Star appears at the upper End, and the Horizon at the lower End; which when they do, then upon the Side of the Staff belonging to the Cross used in Observation, will be found the deg. and min. of Altitude of the Sun or Star. But the greatest Altitude being that which is required, Observation must be continued as frequently as Judgment shall direct, until the Sun or Star be at the highest, and as the Sun or Star rises, the Sky will appear instead of the Horizon; but when the Sun or Star is past the Meridian, and begins to fall, the Sea will appear instead of the Horizon, and then is the Observation finished; and upon the side of the Staff proper to the Cross used, are found the deg. and min. of the Sun's Meridian Altitude; which subtracted from 90 deg. gives the Complement of the Altitude; or it may be taken off the Staff at once (the Staff being numbred with the Complement as is shewed before) with which to proceed in finding the Latitude of the Place, observe the Rules and Directions foregoing.

The Description and Use of the Nocturnal.

IT consists of three Parts, the first and unmoveable Part, on which is the Handle, by which to hold it in time of Observation; upon the fore-side of which, in the outermost Circle are the Days of the Month, and upon the innermost are set off the 24 Hours, and upon the Backside are the 32 Points of the Compass.

There are two sorts of *Nocturnals*, the one made for the *Great Bear*, the other for the *Little Bear*. Those that are made for the *Great Bear* have *February* at the Top, but those that are made for the *Little Bear* have *April*, but now they are commonly made for both *Bears*, having two Indices.

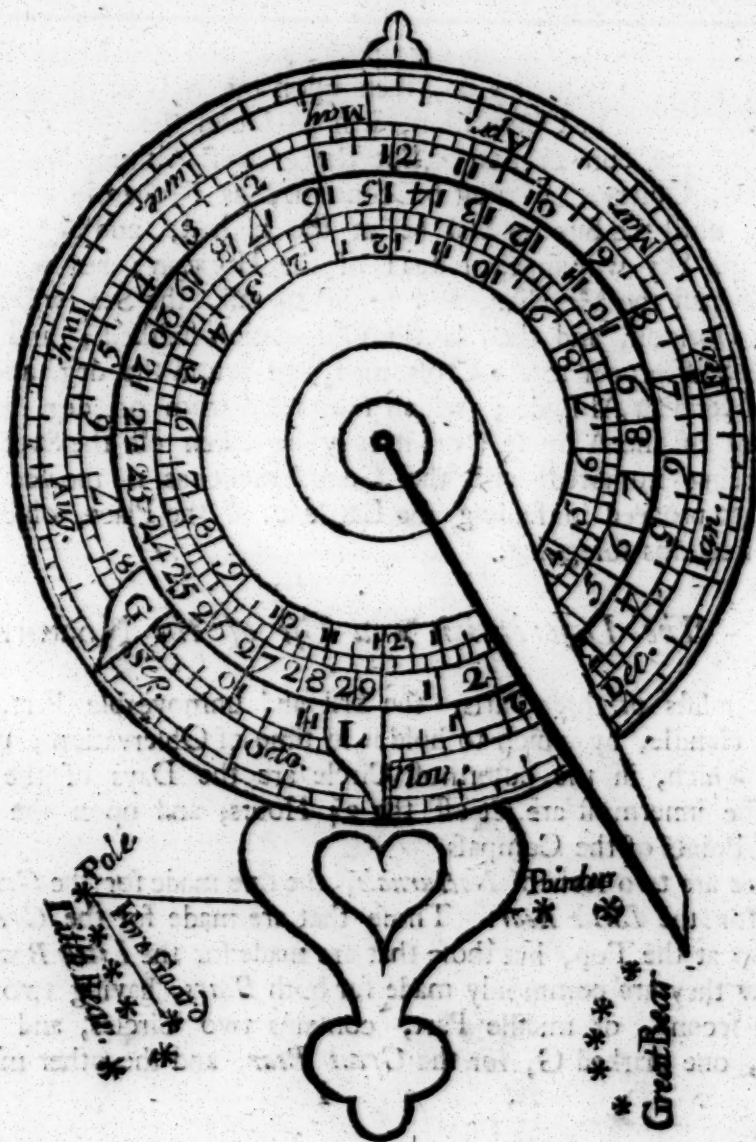
The second, or middle Part, contains two Circles, and the aforesaid Indices, one marked G, for the *Great Bear*, and the other marked L, for the

The Description of the Nocturnal.

the *Little Bear*. The outermost Circle is divided into 29 Days and an half, being the Moon's Age; the innermost into 24 Hours; the Index belonging to the Bear you intend to observe by, is to set to the Day of the Month at pleasure.

The third and uppermost Part is a long Index; the Edge of which (that respects the Center) must be turned to the Guards or Pointers, in Time of Observation.

To find the Hour of the Night, and upon what Point of the Compass the Guards are.

The Figure of the Nocturnal.

To do this, First, set the Index of the middle Part to the Day of the Month, then hold the Instrument upright, which may be discerned by the Tip on the Top of the Nocturnal, then look through the Hole in the Middle of the Nocturnal for the *North Star*; which having found, turn the Edge of the long Index to the Guards or Pointers, according as you observe by the *Little* or *Great Bear*, then shall the Edge of the Index (upon the innermost Circle of the middle Part) give the Hour of the Night.

Also, in Nocturnals made for both Bears, you have on the back side two Circles mark'd at the Bottom, the outermost with *L*, and the innermost with *G*; and numbred round with Degrees and Minutes, for finding how much the *Pole Star* is above or below the true Pole; to find which, having fitted the *Nocturnal* as before directed, observe what Figures on the Back-side fall under the Edge of the long Index, in the Circle belonging to the Bear by which you observe, and that is the Deg. and Min. that the Star is above or under the Pole, as is distinguish'd by the Words *Abo.* and *Und.*

Example. To observe by the *Great Bear*, *Sept. 6.* I set the Index marked *G*, to *Sept. 6*, and looking through the Hole to the Pole, I turn the long Index till it lie just over the two Pointers, as you see in the Figure of the *Nocturnal*, and find on the innermost Circle of the middle Part of the *Nocturnal*, that it is Two a Clock in the Morning; and on the Back-side in the Circle marked *G*, I find the Pole Star is 2 deg. 26 min. above the Pole, &c. 'tis found also by the following Table.

To find the Moon's Southing, and Time of Full Sea by the Nocturnal.

TO do this, it is but looking upon the middle Piece of the *Nocturnal*, and in the outermost Circle find the Moon's Age; and opposite to it in the innermost Circle of the same Piece stands the Southing.

Ex. Suppose the Moon 25 Days old, and the Time of her Southing required.

Look for 25 the Moon's Age in the outermost Circle, opposite to which in the innermost Circle stands 8, which is the Moon's Southing at 25 Days old required.

Note, That always between the Change and the Full, the Moon comes to South in the Afternoon, but after the Full in the Morning.

Thus having found the Moon's Southing, add thereto the Time of Flowing upon the Full and Change Days at any Place, and that gives the Time of Full Sea when required. But this has been sufficiently shewed in another Place, and therefore needs no Example.

The Use of the following Table of the Declination of the North Star.

THE Use of the Table is this: Having taking the Alt. of the *Pole Star*, then observe with the *Nocturnal* upon what Point of the Compass the Guards are; opposite to which in this Table stands the Declination (so called) which if the Star be below the Pole, is to be added to the Altitude, but if the Star be above the Pole, to be subtracted therefrom, to find the Latitude of the Place.

But the more exact Way to find the Latitude, is by those other Directions for the Stars before given.

A Table of the Latitude and Longitude of the principal Harbours, Headlands, and Islands in the World; Corrected by the latest and best Observations; accounting the Longitude from the Meridian of the LIZARD.

Note, When the Latitude and Longitude of an Island is given, the middle of the Island is meant, except some particular Part of it be expressed.

Places Names.	Latitude North.		Longit. E. or W.		Places Names.	Latitude North		Longit. E. or W	
	D. M.		D. M.			D. M.		D. M.	
The Coast of England.									
Berwick	55	50	03	35 E	North Part of Lewis Island	58	20	02	01 W
Newcastle	54	58	03	44 E	St. Kilday	58	02	04	51 W
Stockton	54	33	03	49 E	Farra Head	58	23	00	09
Spurn	53	35	05	44 E	Northern Isles of Orkney	59	13	01	44
Yarmouth	52	45	06	54 E	Shetland S. Point	59	52	03	44
LONDON	51	32	05	14 E	Buchanefs	57	55	00	54
North Foreland	51	28	06	24 E	Aberdeen	57	24	03	37
Beachy	50	48	05	39 E	Dundee	56	30	02	38
Dunnose Isle Wight	50	38	03	51 E	Edinburgh	55	57	02	10
Portland	50	30	02	26 E	The Coast of Ireland.				
Start Point	50	06	02	29 E	Dublin	53	12	01	50
LIZARD	50	00	00	00	Wexford	52	13	02	02
Land's-end	50	06	00	46 W	Waterford	52	07	02	38
St. Mary Scilly	49	57	01	31 W	Cork	51	49	04	16
Hartland Point	51	06	00	39 E	Cape Clear	51	10	05	16
Lundy Isle	51	20	00	34 E	Limrick	52	22	04	34
Bristol	51	32	02	39 E	Galway	53	10	04	49
St. David's Head	51	55	00	08 W	Sline Head	53	20	06	01
Barfey Isle	52	46	00	16 E	Londonderry	54	55	02	46
Holy-head	53	23	00	34 E	Belfast	54	36	01	36
Liverpool	53	20	02	16 E	The Coast of Holland and Flanders.				
Whitehaven	54	25	01	59 E	Scaw	57	26 N	15	24 E
Carlisle	54	45	02	49 E	Helighland	54	28 N	13	49 E
The Coast of Scotland.									
Glasgow	55	53 N	01	09 E					
N. Part of Skye Isle	57	50 N	00	07 W					

A Table of Latitude and Longitude.

Places Names.	Latitude North		Longit. E. or W.		Places Names.	Latitude North		Longit. East	
	D. M.		D. M.			D. M.		D. M.	
Hambrough	53	41	15	40	Cape Paul	37	58	04	52
Emden	53	05	12	40	Cape Martin	39	00	05	42
The Fly	53	18	10	49	Barcelona	41	30	07	35
The Texel	53	10	10	13	Marseilles	43	20	10	29
Amsterdam	52	23	10	15	Toulon	43	07	10	55
Rotterdam	51	55	09	25	Genoa	44	25	13	54
The Brill	51	56	09	24	Leghorn	43	18	15	43
Sluyce	51	19	09	04	Rome	41	54	18	02
Calice	50	57	07	14	Naples	41	05	19	42
The Coast of France and Portugal.					Cape Spantavento	38	00	25	12
Diep	49	56	04	08	Cape Collone	39	10	23	14
Cape de Hague	49	46	03	08	Gallipoli	40	08	23	53
Caskets	49	50	02	42	Cape St. Mary	39	56	24	14
Guernsey	49	36	02	34	Ancona	43	31	19	54
St. Maloes	48	38	03	00	Venice	45	18	18	24
Morlaix	48	37	01	24	Lepanto	38	20	27	09
Ushant	48	30	00	09	Cape Matapan	36	35	27	34
Brest	48	23	00	40	Cape St. Angelo	36	41	28	34
Penmark	47	48	00	59	Athens	38	00	29	43
Bell Isle	47	20	02	04	Cape Martelo S.	38	00	30	59
Nantz	47	14	03	25	P. of Negropont	38	00	31	19
Island Dieu	46	40	02	59	Cape Monre Sancto	40	05	28	18
Island Ree	46	13	03	44	Salonica	40	41	33	12
Rochel	46	10	04	07	Gallipoli	40	30	34	05
Bordeaux	44	50	04	50	Constantinople	41	07	32	29
Bilboa	43	30	02	14	Myrna	38	28	32	29
Cape Ortegal	44	02	02	26W	Ephesus	37	54	32	29
Cape Finister	43	06	04	46W	Antiocheta	36	40	36	51
Port a Port	41	18	04	06W	Scandaroon	36	00	41	12
Burlings	39	39	05	01W	Aleppo	35	40	42	25
Rock of Lisbon	38	54	05	06W	Tripoli	34	40	40	54
Lisbon	38	43	03	57W	Alexandria	31	07	36	04
Cape St. Vincent	37	00	34	18W	Cape Rufato	33	15	27	09
Cadiz	36	16	01	46W	Cape Miterato	32	43	21	37
Cape Trefalgar	36	10	01	16W	Tripoly	32	54	18	10
The Coast on the Main Continent within the Straits.					Cape Bona	37	05	15	14
Gibraltar	36	11N	00	29W	Bona	37	00	12	14
Cape de Gat	37	03N	03	12E	Algier	36	40	08	19
					Cape de tres forcas	35	34	03	49

A Table of Latitude and Longitude.

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Places Names.	Latitude North.		Longit E. or W.		Places Names.	Latitude N or S		Longit E. or W.	
	D.	M.	D.	M.		D.	M.	D.	M.
Tetuan	35	28	N 00	38	W	19	30	11	12
Ceuta	35	55	N 00	53	W	13	16	10	06
Tangier	35	55	N 01	00	W	08	36	07	01
Islands within the Straits.					Monferado	06	05	04	06
Alboran	36	10	2	44	Cape Palmos	04	03	00	22
Formentaria	38	44	7	04	Jaque Jaque	04	16	02	44
Yvica	39	5	8	04	Astene	04	15	04	14
Majorca	39	35	8	25	Cape 3 Points	04	13	05	59
Minorca City	39	48	7	54	River Volta	05	40	08	44
Port Maon Minorca	39	42	9	26	River Formosa	07	00	12	54
Gallitra	37	40	13	48	Cape Formosa	04	40	13	14
Sardinia South End	39	12	13	48	New Callabar	04	12	15	39
Corfica North End	42	57	14	59	Old Callabar	03	18	16	46
Gorgona	43	34	14	52	River Camerones	04	02	18	24
Capria	43	06	14	54	River de Angra	00	49	18	29
Lilboa	42	44	15	19	Lopas	1	05	17	34
Messina	38	22	11	39	River Congo	5	45	20	39
Maritimo	38	12	17	09	Angola	8	51	21	10
Cape Passero	36	48	21	18	Cape Negro	6	08	20	00
Malta	35	54	19	50	Cape St. Thomas	13	10	19	37
Corfu	39	45	25	56	Secos	18	56	20	46
Chefalonina	38	15	27	03	C. Bona Esperance	34	25	22	39
Zant	37	47	26	24	Western Islands.				
Modon or Morea	36	52	26	46	Corvo	10	05	24	41
Lemnos	39	50	30	41	Flores	19	40	24	36
Scio	38	20	29	09	Fyal	18	53	22	02
Lima	43	00	21	28	Pico	38	32	21	17
C. St. John West	35	20	28	41	St. George	38	56	20	56
end of Candy					Tercera	38	53	19	28
Cape Solomon, E.	35	25	31	45	St. Michael	38	00	17	18
end of Candy					St. Maries	37	00	17	03
Rhodes City	36	42	33	10	The Canary Islands.				
West end of Cyprus	35	21	36	49	Ferro	28	00	12	58
East end of Cyprus	35	35	59	39	Palma	28	50	12	46
The Coast of Barbary and Guinea.					Gomero	28	00	12	12
Cape Spartel	35	46	20	41	Teneriff	28	20	11	31
Ballee	33	43	01	16	Madeira West end	32	17	12	08
Cape Cantin	32	16	04	06	Porto Sancto	32	50	10	36
Cape de Geer	30	04	04	56	Cantaria	27	42	11	00
Cape Bajador	6	12	09	16	Fortaventura	27	54	08	10
Cape Olerado	23	41	10	36	Lanceroia	28	32	07	40
Cape Blanco	20	35	11	41	Cape				
Senegall	15	16	10	26					

Places Names.	Latitude N. or S.		Longit. E. or W.		Places Names	Latitude N. or S.		Longit. East.	
Cape de Verde Islands.	D. M.		D. M.			D. M.		D. M.	
St. Antonio	17	10	20	34	Dew Point	15	50	87	19
St. Vincent	16	55	20	24	Vifegapatam	17	40	90	21
St. Lucia	16	45	20	16	Cape Palmaris	20	45	93	24
St. Nicholas	16	40	19	36	Ballafore Road	21	20	91	07
Brava	14	35	19	52	Bengal	22	27	97	03
Fuogo	14	42	19	14	Cape Negrais	26	23	98	19
Jago	15	20	18	24	Cape Malacca	20	25	108	34
Isle of May	15	16	17	26	Siam Entrance	13	10	106	15
Isle of Sal	16	45	17	16	Cambodia Entrance	10	30	110	34
Bonavista	16	05	17	09	Cochin	18	25	109	12
Southern Islands.					Macao	22	13	121	10
St. Matthews	01	40 S	02	19 W	Canton	23	20	118	10
Ascension	08	10 S	07	21 W	Amoy or Quemoy	24	35	122	09
St. Helena	16	06 S	00	26 W	Lampo	30	10	125	39
Fernandepo	02	35 N	17	09 E	Nanquin	32	52	125	19
Priniceps	01	25 N	16	14 E	Islands in the East-Indies.				
St. Thomas	00	00	15	12 E	Madagascar } S end	26	06	51	34
Annabona	01	42 S	14	02 E	St. Laurence } N end	12	10	55	24
The Coast on the Main Continents in the East-Indies.					Mayetta	13	10	50	59
Cape Lagulias	35	35 S	23	54	Mohilla	12	15	48	55
Cape Bon Esperance	34	15 S	21	40	Comero	11	50	48	59
Cape Corientes	23	52 S	40	49	St. Juan de Nova	17	30	47	49
Mofambique	15	05 S	45	44	Mauritius	20	05	60	19
River de Fugos	00	00	46	29	Digo Royes	19	45	66	49
Cape Bassos	04	00	55	04	Romeras de Castela	29	05	72	10
Cape Guardafoy	11	50	57	44	Amsterdam [mos	39	50	79	38
Cape Rosulgat	22	27	65	59	St. Brandon	16	38	69	44
Cape Muca	26	56	62	24	Digo Gratiosa	08	42	74	19
Butlera	30	00	54	19	Quabella	03	49	57	53
Surrat	21	08	78	39	Bassos de Chagos	05	05	75	39
Goa	15	22	79	51	Yas de Digo Rays	00	00	77	19
Calcutte	11	17	80		Maldivia } N. end	07	05	78	19
Cochin	09	58	86	59	Maldivia } S. end	01	00	81	29
Cape Comerine	07	50	83	39	Malique	09	00	78	29
Fort St. George	13	08	86	56	Sacatra	12	28	60	51
					Abdeleur	12	10	59	37
					Cape Gallo de Zelone	06	07	85	59

A Table of Latitude and Longitude.

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Places Names.	Latitude N. or S.	Longit. E. or W.	Places Names.	Latitude N or S.	Longit West
	D. M.	D. M.		D. M.	D. M.
Yas de Amber —	00 00	N 57 44	Bay Bonaventuro —	23 28	N 74 52
Andaman —	13 00	Latitude 96 39	Island Gallopega —	00 00	84 56
Nicobor —	07 05	98 09	Cape del Ajuga —	06 38	83 36
Sumatra NW. End	05 28	98 59	Lima —	12 30	68 16
Verkins Island —	02 22	99 21	Arica —	18 12	68 56
Nassau Island —	02 44	103 46	La Serena —	24 40	71 18
Bencola —	03 50	106 27	I. Juan Fernando —	33 23	81 34
Sumatra SE. End —	05 42	109 18	Baldivia —	32 35	76 06
Engano —	05 40	106 07	Port Steven —	46 50	77 22
Selam —	08 20	107 27	Cape Victory —	52 15	78 06
Princes Island —	06 30	109 16	Cape Horn —	57 58	74 41
Bantam in Java —	05 47	110 04	The Coast of Brazile in South America, from Cape Horn to Cape Roque.		
Batavia —	06 15	110 55	Magellan E. entran.	51 58	70 16
Java East End —	08 35	109 32	River Julian —	48 40	69 18
Straits of Sundy —	05 52	111 51	Cape blanco near	46 50	65 51
Banca South End —	03 25	118 09	R. Camarones }		
Borneo South Point	04 14	131 51	Buenos Aires R. Plata	34 35	52 50
Bandy Isles —	05 05	131 51	River Grand —	31 55	46 26
Celebes { South end	06 00	122 41	St. Katherine's —	28 00	42 36
{ N. end —	01 40	126 44	Cape Frio —	23 10	37 42
Mindano West point	06 30	123 49	Spirito Sancto —	19 58	36 46
Borneo North Point	07 10	117 59	P. Segura —	16 22	35 44
Luconio { S. point.	12 30	126 04	Bay Todus Sanctus	13 00	35 21
{ NE. poi.	18 35	124 19	R. St. Francisco —	10 55	32 32
Anain { W point	19 30	113 20	Olinda or	07 48	29 50
{ E. point	19 55	116 30	Pernambuch {		
Formosa { S point	22 00	124 44	Cape St. Augustine	08 05	30 24
{ N point	25 32	125 39	Cape Roque —	05 00	30 38
Piscadore Isles —	23 30	122 49	Tristhan de Cunha	37 05	19 24
Islands Chusan —	30 38	125 49	Trinidad —	20 30	24 46
Japan { S.E. point	39 50	140 29	The Coast of the Main Continent in the West-Indies.		
{ S.W point	39 10	132 00	R. Amazonas Entr.	00 00	43 40
The Coast of America in the South Sea, from Callifornia to Cape Horn.			North Cape —	02 05	44 41
Cape St. Sebastian —	42 30	124 41	Suranam —	06 00	51 41
Cape St. Lucia —	23 25	106 42	Oronoque —	08 15	53 51
Cape Corientes —	17 40	105 16	C. Coquibaca —	12 50	55 26
Aquapulco —	17 00	101 14	Carthagen —	10 30	70 2
Aquatuleo —	15 27	95 49	Scots Settlement —	08 30	73 31
Malimela —	14 25	99 46	Nicarague Entrance	11 15	79 51
Panama —	08 56	77 08	Cape Catocha —	21 12	83 41

A Table of Latitude and Longitude.

Places Names.	Latitude North.		Longit. West.		Places Names.	Latitude North.		Longit. West.	
	D.	M.	D.	M.		D.	M.	D.	M.
Campeche	19	20'N	87	51'W	Bahama Island	27	05	73	44
La Vera Cruz	19	15'N	95	11'W	Abacco S. Point	25	50	72	06
Mexico	20	06'N	97	00'W	Harbour Island	25	40	71	21
Escondido	30	20'N	84	16'W	Andros N. Point	25	15	73	46
Cape Florida	24	48'N	76	41'W	Providence	25	00	72	31
The Caribbee Islands.					Illathera S. point	24	30	70	48
Trinidad	10	05	54	51	Cat Island	24	25	70	06
Tobago	11	10	54	06	Watling Island	24	07	69	36
Granado	12	07	55	16	Rum Key	23	45	69	51
Barbadoes	12	58	53	40	Exuma	23	25	70	43
St. Vincent	13	12	54	08	Crooked Isle N. point	23	03	68	46
St. Lucia	13	52	54	03	Atkins Key	22	30	69	01
Martinico	14	44	55	20	Meraparovuz	21	57	69	26
Dominico	15	35	53	13	Atwood Keys	23	09	68	16
Marigallante	15	53	53	06	French Keys	22	40	68	21
Guardalupa	16	30	54	09	Mayaguana	22	35	67	46
Monferat	16	40	54	21	Hogsties	21	15	68	36
Anregoa	17	00	54	07	Hyneago	20	57	68	06
Nevis	17	06	55	04	Cankcofs Bank	20	50	66	01
St. Christophers	17	22	55	21	N. point	21	35	64	54
Barbuda	17	43	54	11	Turks Island	21	40	63	26
St. Bartholomew	17	54	55	31	Abrollo N. point	21	03	62	56
St. Martins	18	05	55	25	Platewrack	20	03	62	56
Anguilla	18	13	55	41					
Virgins	18	23	57	08					
St. Cruz	17	38	57	21					
Bieque	18	00	58	01					
Porto Rico St. Johns	18	33	59	06					
St. Domingo Hispan.	18	15	63	36					
P. Royal Jamaica	17	40	71	27					
East End of Cuba	20	20	68	51					
Havana	22	50	78	16					
Bay Hondy	22	35	79	26					
Cape St. Antonia	21	50	81	18					
Bahama Islands.									
Bermudas	32	30'N	56	16'W	Charles Town	32	40	73	36
N. Point	28	22'N	73	01'W	upon Ashly River	35	10	69	11
Bahama Bank					Cape Flatteras	37	00	69	16
					Cape Henry	37	14	69	01
					Cape Charles	39	04	68	11
					Cape Hinlopen	40	05	65	26
					Long Island	40	40	68	54
					New York				Cape

The Coast of Carolina, Virginia, Maryland, Pennsylvania, New-England, and New-foundland.

Places Names.	Latitude North.		Longit. West.	
	D.	M.	D.	M.
Charles Town	32	40	73	36
upon Ashly River	35	10	69	11
Cape Flatteras	37	00	69	16
Cape Henry	37	14	69	01
Cape Charles	39	04	68	11
Cape Hinlopen	40	05	65	26
Long Island	40	40	68	54
New York				Cape

A Table of Latitude and Longitude.

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Places Names	Latitude North	Longit. West	Places Names.	Latitude North	Longit. E. or W.
	D. M.	D. M.		D. M.	D. M.
Cape Cod ———	42 10	62 31	The Coast of Iceland, Greenland, Nova Zembla, and the Northern Isles.		
Boston ———	42 25	65 27	Sound Royal ———	66 22	19 29
Cape Sable ———	43 45	58 11	Bargazer Point —	66 30	16 26
Island Sable ———	44 30	53 51	Whales Back ———	65 27	15 19
Cape Britain ———	46 20	53 06	Merchants Foreland	63 20	19 19
Quebeck ———	47 05	64 36	Halliford ———	64 30	29 29
Bay of Brest ———	52 10	49 46	Fair Foreland ———	65 10	31 59
Bell Island ———	52 05	48 56	Grims Island ———	66 51	22 59
Cape St. John ———	50 09	47 21	Westmania Isles —	63 51	23 24
Cape Bonavista —	49 11	46 49	Isles of Fero ———	62 06	00 14
Trinity Bay ———	48 27	49 41	Beerenberg, or	North Latitude.	East Longitude.
Conception Bay —	47 53	48 56	John Mains Isle }		
St. John's Harbour	47 28	48 41	Point Lookout ———		
Bay of Bulls ———	47 40	49 32	Horn Sound ———		
Cape Race ———	46 30	48 11	Fair Foreland ———		
Cape St. Mary ———	47 10	48 06	Hacluits Headland		
Placentia ———	47 57	49 46	Helies Sound ———		
Cape Roy ———	48 21	52 01	Lees Foreland ———		
The Coast of Hudson's Bay, and the Straits.			Whales Head ———		
Buttons Isles ———	60 05	64 36	Hope Island ———		
Cape Charles ———	62 35	70 06	Cherry or Bear Isle		
Cape Walsingham	63 05	72 26	Admiralty Island —		
Mansfield Isle —	62 20	70 16	Fretum Borough —		
Cape Jones ———	55 03	73 01	Cape Candemose —		
Ruperts River —	51 16	73 41	Carnose ———		
Albany River ———	52 32	77 51	Archangel Bar ———		
The Cubbs ———	54 18	77 36	Cross Island ———		
C. Henrietta Maria	55 06	77 48	Sweetnose ———		
Port Nelson ———	57 05	87 36	Kilduyn ———		
Cape Churchill —	59 00	87 43	North Cape ———		
C. Southampton —	62 57	83 16	Surroy ———		
Shark Point ———	64 27	78 06	Tromsund ———		
Nottingham Isle —	63 38	74 32	Loefort SW. Point		
Q. Ann's Foreland	63 32	69 37	Dronon ———		
Resolution Isle —	61 55	59 36	Stadland ———		
Cape Farewell —	59 10	41 31	North-bergen ———		
			Naze of Norway —	57 50	12 36

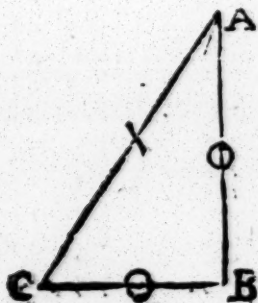
Places Names.	Latitude North.		Longit. East.		Places Names.	Latitude North.		Longit. East.	
Sea-Coast in the Sound, and Baltick Sea.	D. M.		D. M.			D. M.		D. M.	
Mardau ———	58	25	14	19	Narve ———	58	39	33	28
Larwick ———	58	54	14	34	Revel ———	59	00	29	59
Christiana ———	59	15	14	59	Riga ———	56	50	30	04
Maesterland ———	57	58	6	59	Derwinda ———	57	20	17	14
Gottenberg ———	57	53	17	39	Coningsberg ———	54	43	26	40
Elfinor ———	56	00	17	46	Dantzick ———	54	04	24	07
Roslock ———	54	37	16	45	Wisby in Gotland	57	37	24	04
Copenhagen ———	55	44	17	49	Bornholm ———	55	27	20	07
Valsterborn ———	55	20	18	09	Straellound ———	54	45	18	34
Uraniburg ———	55	54	17	55	Lubeck ———	54	46	15	00
Kalmer ———	56	40	21	54	Anout ———	56	42	16	12
Stockholm ———	59	20	23	39	Lefou ———	57	05	5	54
Wyborg ———	60	20	34	40	Scaw ———	57	26	5	24
Petersburg ———	60	30	35	25					

Problems of Plain Sailing, wrought by the Logarithms and by Gunter's Scale.

P R O B L E M I.

THE Course and Distance being given; to find the Difference of Latitude and Departure.

Example. Suppose a Ship sails South West by South 382 Minutes, and it is required to find the Difference of Latitude and Departure.



In the Triangle ABC.

AC represents the Distance sailed.

AB the Difference of Latitude.

BC the Departure.

BAC (or the Angle at A) the Angle of the Course.

ACB (or the Angle at C) the Complement of the Course to 90 deg.

Characters

Characters used in Navigation and Astronomy.

S. stands for Sine.

T. for Tangent.

Sc. Sine Complement. Tc. Tangent Complement.

The given Sides and Angles of a Triangle are mark'd wth a Dash thus (').

The required Sides and Angles with a Cypher thus (°).

The Operation by the Logarithms. For the Difference of Latitude.

As Radius	_____	_____	10 000000
To the Distance sailed 382 Minutes	_____	_____	2.582063
So is Sc. of the Course 56d. 15m.	_____	_____	9.919846
To the Difference of Latitude 317 Minutes $1\frac{6}{10}$	_____	_____	12.501909

For the Departure.

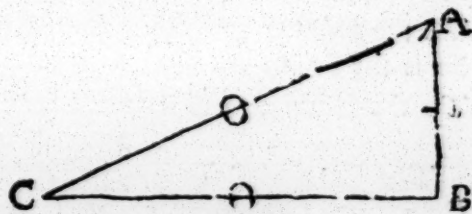
As the Radius	_____	_____	10.000000
To the Distance sailed 382 Minutes	_____	_____	2.582063
So is the S. of the Course 33d. 45m.	_____	_____	9.744739
To the Departure 212 Minutes $\frac{2}{10}$	_____	_____	12.326802

The Operation by Gunter's Scale.

One Foot of the Compasses being in the Radius, or S of 8 Points; extend the other to the Distance 382 Minutes, the said Extent laid from S. Course 3 Points will reach to 212 $\frac{2}{10}$ Minutes the Departure from the Meridian, and the Compasses kept at the same Distance will reach from the Sc. Course 5 Points to 317 $\frac{6}{10}$ Minutes, the Difference of Latitude, as above.

P R O B. II. The Course and Difference of Latitude given, to find the Distance and Departure.

Suppose a Ship sails W.S.W. until the Difference of Latitude be 219 Leagues, and the Distance and Departure required.



The Operation by the Logarithms. For the Distance.

As the Sc. of the Course 22d. 30m.	_____	_____	9.582840
To the Difference of Latitude 219 Leagues	_____	_____	2.340444
So is Radius	_____	_____	10.000000
To the Distance, which is 572 $\frac{2}{10}$ Leagues	_____	_____	2.757604

For

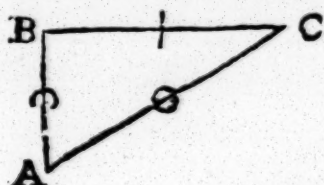
For the Departure.

As Radius	_____	_____	10.000000
To the Distance $572 \frac{1}{8}$ Leagues found before	_____	_____	2.757548
So is the Sine of the Course 67 deg. 30 min.	_____	_____	9.965615
To the Departure $528 \frac{5}{8}$ Leagues	_____	_____	12.723163

By the Gunter.

The Compasses being extended from the S. of 2 Points, the Complement of the Course to 219 Leagues, the Difference of Latitude, will reach from Radius S. 8 Points, to $572 \frac{1}{8}$ Leagues the Distance, and the same Extent of the Compasses from the Sine of the Course 6 Points, will reach to $528 \frac{5}{8}$ Leagues, the Departure.

P R O B. III. The Course and Departure given, to find the Distance and Difference of Latitude.



Suppose a Ship sails North East by East, until her Departure be 220 Minutes, the Distance and Difference of Latitude required.

By the Logarithms. For the Distance.

As the S. of the Course 56d. 15m.	_____	_____	9.919846
To the Departure 220 Minutes	_____	_____	2.342423
So is Radius	_____	_____	10.000000
To the Distance 265 Minutes	_____	_____	12.422577

For the Difference of Latitude.

As Radius	_____	_____	10.000000
To the Distance 265 Minutes	_____	_____	2.423246
So is the Sc. of the Course 33 deg. 45 min.	_____	_____	9.744739
To the Difference of Latitude $147 \frac{1}{2}$ Minutes	_____	_____	12.167985

By the Gunter.

The Extent of the Compasses from the S. of the Course 5 Points, to the Departure 220 Minutes, will reach from Radius S. of 8 Points, to 265 the Distance, and the same Extent of the Compasses from S. 3 Points the Complement of the Course, will reach to the Difference of Latitude $147 \frac{1}{2}$ Minutes as above.

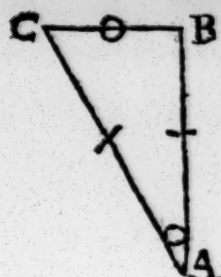
P R O B. IV. The Distance and Difference of Latitude given, to find the Course and Departure.

Sup.

Plain Sailing.

79

Suppose a Ship sails between the North and the West 206 Miles, until the Difference of Latitude be 197 Miles, the Course and Departure required.



By the Logarithms. For the Course.

As the Distance 206 Miles	_____	_____	_____	2.313867
To the Radius	_____	_____	_____	10.000000
So is the Difference of Latitude, 197 Miles	_____	_____	_____	2.294466
To the Sc. of the Course ; which is N. 17d. 00m. West	_____	_____	_____	9.980599

For the Departure.

As Radius	_____	_____	_____	10.000000
To the Distance 206 Miles	_____	_____	_____	2.313867
So is the S. of the Course 17 deg. 00 min.	_____	_____	_____	9.465935
To the Departure 60 $\frac{23}{100}$ Miles	_____	_____	_____	11.779802

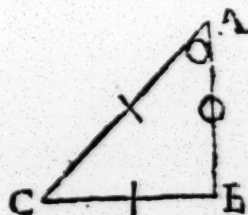
By the Gunter.

For the Course. The Extent from the Distance 206 Miles, to the Difference of Latitude 197 Miles, will reach from Radius S. 90 deg. to the Sine of 73 deg. 00 min. the Complement of the Course, which subtracted from 90d. is 17d. 00 min. the Course N. Westerly, or N by W. half W.

For the Departure. The Extent from Radius S. 90 deg. to the Sine of the Course 17 deg. 00 min. will reach from the Distance 206 Minutes to the Departure 60 $\frac{23}{100}$ Minutes as above.

P R O B. V. The Distance and Departure given, to find the Course and Difference of Latitude.

Suppose a Ship sails between the South and the West 247 Minutes, until the Departure be 197 Minutes, and it be required to find the Course and Difference of Latitude.



The Operation by the Logarithms. For the Course.

As the Distance 247 Minutes	_____	_____	_____	2.392697
To the Radius	_____	_____	_____	10.000000
So is the Departure 197 Minutes	_____	_____	_____	2.294466
To the Sine of the Course 52 deg. 54 min. Westerly	_____	_____	_____	9.901769

For

Plain Sailing.

For the Difference of Latitude.

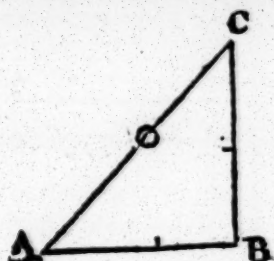
As Radius	_____	_____	_____	10.000000
To the Distance 247 Minutes	_____	_____	_____	2.392697
So is the Sc. of the Course 37 deg. 6 min.	_____	_____	_____	9.780467
To the Difference of Latitude 149 min.	_____	_____	_____	12.173164

By the Gunter.

For the Course. The Extent of the Compasses from the Distance 247 Minutes, to the Departure 197 Minutes, will reach the same way from Radius S. 90 deg. to the Sine of the Course 52 deg. 54 min. South Westerly, or South West three quarters West.

For the Difference of Latitude. The Extent from Radius S. 90 deg. to the S. 37 deg. 6 min. the Complement of the Course, will reach the same way from the Distance 247 min. to the Difference of Latitude, 149 min.

P R O B. VI. The Difference of Latitude and Departure given, to find the Course and Distance.



Suppose a Ship sails between the South and West until the Difference of Latitude be 154 Leagues, her Departure 200 Leagues, and it be required to find the Course and Distance.

The Operation by the Logarithms. For the Course.

As the Difference of Latitude 154 Leagues	_____	_____	2.187524
To Radius	_____	_____	10.000000
So is the Departure 200 Leagues	_____	_____	2.301030
To the Tang. of the Course 52 deg. 24 min. South Westerly	_____	_____	10.113509

For the Distance.

As the Sc. of the Course 37 deg. 36 min.	_____	_____	9.785433
To the Difference of Latitude 154 Leagues	_____	_____	2.187521
So is the Radius	_____	_____	10.000000
To the Distance 252 $\frac{1}{3}$ Leagues	_____	_____	2.402088

By the Gunter.

For the Course. The Extent of the Compasses from the Difference of Latitude 154 Leagues, to the Departure 200 Leagues, will reach from Radius or Tangent of 45 deg. to the Tangent of the Course, 52 deg. 24 min. South Westerly, or South West 3 quarters West.

For the Distance. The Extent from the S. 37 deg. 36 min. the Complement of the Course, to Radius, or the Sine of 90 deg. will reach from the Difference of Latitude 154 Leagues, to the Distance 252 $\frac{1}{3}$ Leagues.

*

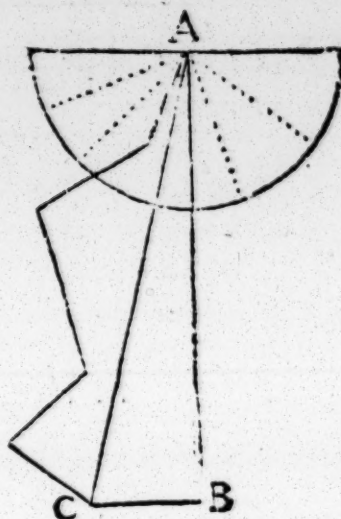
P R O B.

P R O B. VII.

This Problem shews the manner of working a Traverse; and is very useful in keeping a Reckoning by Plain Sailing.

Example.

Suppose a Ship bound to a certain Port, and she sails first S S W. 40 minutes, then SW. 60 min. then S by E. 63 min. WSW. 49 min. then S. E. by S. 56 min. the Difference of Latitude and Departure the Ship hath made, with the direct Course and Distance is required.



The Operation by the Logarithms.

For the Difference of Latitude for the first Course.

As Radius	_____	_____	_____	_____	10.000000
To the Distance 40 min.	_____	_____	_____	_____	1.602060
So is the Sc. of the Course $22^{\circ} 30'$	_____	_____	_____	_____	9.965615
To the Difference of Latitude, 36 min. $\frac{2}{10}$	_____	_____	_____	_____	11.567675

For the Departure of the first Course.

As Radius	_____	_____	_____	_____	10.000000
To the Distance 40 min.	_____	_____	_____	_____	1.602060
So is the S. of the Course $22^{\circ} 30'$	_____	_____	_____	_____	9.582840
To the Departure 15 min. $\frac{3}{10}$	_____	_____	_____	_____	11.184900

By the Gunter.

The Extent of the Compasses from Radius the S. of 8 Points, to the Distance 40 min. that Extent in the Compasses laid from the Sine of the Course 2 Points will reach to 15 min. $\frac{3}{10}$ the Departure, and the Compasses being kept to the same Extent, and laid from the S. 6 Points, the Complement of the Course, will reach to 36 min. $\frac{2}{10}$ the Difference of Latitude.

In the same manner proceed to find the Difference of Latitude and Departure for each Course and Distance; which being found, place in a Table as follows.

L

The

Plain Sailing.
The Traverse Table.

<i>Course.</i>	<i>Distance.</i>	<i>North.</i>	<i>South</i>	<i>East</i>	<i>West.</i>
S S W	40		37.0		15.3
S W	60		42.4		42.4
S by E	63		61.8	12.3	
W S W	49		18.8		45.3
S E by S	56		46.6	31.1	
		<i>Diff. Lat.</i>	206.6	43.4	103.0
				<i>Dep.</i>	43.4
					59.6

The Explanation of the TABLE.

For the placing the Difference of Latitude and Departure in their proper Columns, observe, that if the Course be Northerly the Difference of Latitude is put in the North Column; if it be Southerly in the South Column; and if the Course be Easterly, the Departure is put in the East Column; if Westerly in the West Column.

Thus having framed the Table, add up the North, South, East, and West Columns severally, whereby the Difference of Latitude appears to be 206 $\frac{6}{8}$ Minutes South, because there is nothing in the North Column; The Departure 59 $\frac{6}{8}$ Minutes West, because so much the West Column exceeds the East: By which Difference of Latitude and Departure, find the direct Course and Distance as follows.

The Operation by the Logarithms. For the direct Course.

As the Difference of Latitude 206 $\frac{6}{8}$ min. 2.315130
 To the Radius 10.000000
 So is the Departure 59 min. $\frac{6}{8}$ 1.775246
 To the T. of the Course 16° 5' South Westerly, because 9.460116
 the South and West Columns exceed the North and East

For the Distance.

As the Sc. of the Course 16d. 5m. 9.982660
 To the Difference of Latitude 206 min. $\frac{6}{8}$ 2.315130
 So is Radius 10.000000
 To the Distance required 215 Minutes 2.332470
By

By the Gunter. For the direct Course.

The Extent of the Compasses from the Difference of Latitude $206\frac{1}{8}$ m. to the Departure $59\frac{1}{8}$ m. will reach from the Tangent of 45° . (or Radius) to the Tangent of 16° . $5m$. the Course required.

For the Distance.

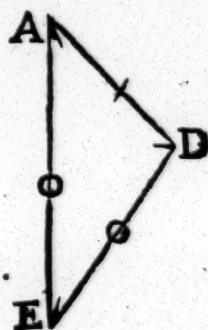
The Extent from $S. 73^{\circ} 55'$ the Complement of the Course, to $S. 90^{\circ}$. viz. Radius, will reach from the Difference of Latitude $206\frac{1}{8}$ m. to the Distance 215 Minutes.

Oblique-angled Plain Triangles, applied in PROBLEMS of Plain-Sailing, and wrought by the Logarithms, and Gunter's-Scale.

PROB. I. **T**HE Angles and one of the Sides given, to find either of the other Sides.

Example.

Suppose there are two Ports both under one Meridian, a Ship sails from the Northermost S.E. 206 Miles, another Ship sails from the Southermost North East by North, a certain Number of Miles, and meets with the first Ship; the Distance between these two Ports, and the Distance sailed by the second Ship is required



In the Triangle ADE.

A and E represent the two Ports. AD the first Ship's Distance. ED the second Ship's Distance. AE the Distance between the two Ports.

The Operation by the Logarithms. For the Distance between the two Ports.

As S. AED $33^{\circ} 45'$.	_____	_____	Co. Ar.	0.255261
To AD the first Ship's distance 206 min.	_____	_____		2.313867
So is S. ADE $101^{\circ} 15'$ which subtract from 180° .	_____	_____		9.991574
To AE the distance between the two Ports $363\frac{7}{8}$ min.	_____	_____		12.560702

In all Operations where Radius is not one of the three given Terms, to save the Labour of subtracting the first Logarithm from the Sum of the second and third, use the Complement Arithmetical of the first Logarithm

rithm, which is found by subtracting each Figure of the Logarithm from 9, except the first towards the Right-hand, which is subtracted from 10, as in the Operation, the Logarithm Sine found in the Table is 9.744739, wherefore beginning at the Left-hand, say 9 from 9 there remains 0; 7 from 9 there remains 2; 4 from 9 there remains 5; 4 from 9 there remains 5; 7 from 9 there remains 2; 3 from 9 there remains 6; 9 from 10 there remains 1. So the Complement Arithmetical of the first Logarithm, is 0.255261, which added to the other two Logarithms, and from the Sum abate Radius, the Remainder is the Logarithm, Sine, or Tangent required.

And *Note*, to find the Sine of any Degree and Minute above 90d. subtract the Degree and Minute from 180d. the Sine of the Remainder is the Sine required.

For the second Ships Distance.

As S. AED 33d. 45m.	_____	_____	_____	Co. Ar. 0.255261
To AD the first Ship's Distance 206 min.	_____	_____	_____	2.313867
So is S. DAE 45d. 00m.	_____	_____	_____	9.849485
To DE the second Ship's Distance, $262\frac{2}{3}$ min.	_____	_____	_____	12.418613

By the Gunter. For the Distance between the two Ports.

The Extent of the Compasses from S. 33 deg. 45 min. to the S. ADE 78d. 45m. (*viz.* the Complement of 101d. 15m. to 180d.) will reach from 206 min. the first Ship's Distance, to $363\frac{1}{3}$ min. the Distance between the two Ports, as above.

For the second Ship's Distance.

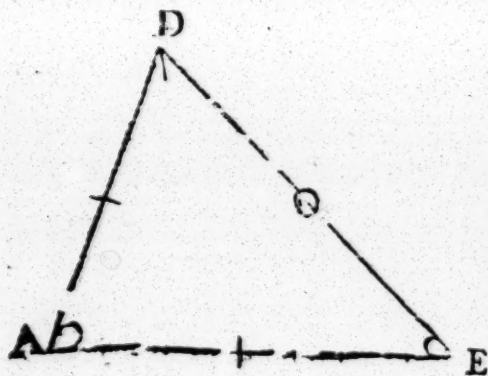
The Extent of the Compasses from the S. of 33d. 45m. to the S. of 45d. 00m. will reach from 206 min. the first Ship's Distance, to $262\frac{2}{3}$ m. the second Ship's Distance required.

P R O B. II.

Two Sides and an Angle opposite to one of them being given, to find the other opposite Angle and the third Side.

Example.

Suppose two Ports, whose Bearing is North East and South West, distant 396 Miles, a Ship at the northermost sails South South East, and another Ship at the southermost sails thence 518 Miles, and meets with the first Ship: The Course sailed by the second Ship, and the first Ship's Distance are required.



Oblique Plain-Sailing.

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In the Triangle ADE.

A represents the Southermost Port, D the Northermost.

AD the Distance between the two Ports.

DE the Course and Distance sailed by the first Ship.

AE the Course and Distance sailed by the second Ship.

The Operation by the Logarithms. For the second Ship's Course.

As AE the second Ship's Distance 518 min.	_____	Co. Ar.	7.285671
To S. ADE 67d. 30m.	_____		9.965615
So is AD the Distance between the two Ports 396 min.	_____		2.597695
To S. AED 44 deg. 56 min.	_____		19.848981

The Angle at D 67d. 30m. and the Angle at E 44d. 56m. being added together and subtracted from 180d. gives 67d. 34m. the Angle at A, which makes nearest 6 Points, and 6 Points reckon'd from the North East to the Southward gives ESE. the second Ship's Course required.

For the first Ship's Distance.

As S. ADE 67d. 30m.	_____	Co. Ar.	0.034385
To AE the second Ship's Distance 518 min.	_____		2.714330
So is DAE 67 deg. 34 min.	_____		9.965824
To DE the first Ship's Distance 518 $\frac{3}{8}$ min.	_____		12.714539

By the Gunter. For the second Ship's Course.

The Extent of the Compasses from 518 min. to 67d. 30m. will reach from 396 min. to S. 44 deg. 56 min. which added to the Angle at D, and the Sum subtracted from 180d. gives 67d. 34m. the Angle at A, as above.

For the first Ship's Distance. The Extent from S. 67d. 30m. to 518m. will reach from S. 67d. 34m. to 518 $\frac{3}{8}$ m. the Ship's Distance as above.

P R O B. III.

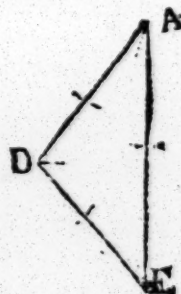
Two Sides and the contained Angle given, to find the other Angle.

Example.

Suppose two Ships sail from one Port; one sails NE. 140 Miles, the other South East by East 115 Miles, the Bearing and Distance of these two Ships is required.

Let D represent the Port, DA the first Ship's distance, and DE the second.

Miles
140
115
255
Diff. 25



The

The Operation by the Logarithms. For the Bearing of the two Ships.

As the Sum of the sides AD and DE 255 min. — Co. Ar. 7.593460
 To the Difference of the said sides 25 min. — 1.397940
 So is the T. of half the Sum of their opposite Angles $50^{\circ} 37'$ — 10.085608
 To the T. of half their Difference, which is 6d. 48m. — 19.077098

The half Difference added to the half Sum, gives 57d. 25m. the greater Angle AED. The half Difference subtracted from it, gives 43d. 49m. the lesser Angle DAE. Wherefore the Bearing of the two Ships is N. Easterly, or South Westerly 1d. 11m.

For the Distance of the two Ships.

As S. AED 57 deg. 25m. — Co. Ar. 0.074374
 To AD the first Ship's Distance 140 min. — 2.146128
 So is S. ADE 78 deg. 45 min. — 9.991574
 To AE the Distance of the Ships, 163 min. — 12.212076

By the Gunter. For the Bearing of the two Ships.

The Extent of the Compasses from the Sum of the sides 255m. to their Difference 25 min. will reach from the T. of the half Sum of the required Angles $50^{\circ} 37'$ to the T. of half the Difference of the said Angles 6d. 48m.

In the foregoing Operation by the *Gunter*, the Practitioner may be at a Loss, because in extending the Compasses from the T. $50^{\circ} 37'$ decreasing, it will fall beyond the T. of 45 deg. at the End of the Line. To remedy this, place the Extent from 255 to 25, from the T. 45d. and it will reach to the T. of 5d. 37m. then letting one Point stand at 5d. 37m. extend the other to the T. of 50d. 37m. this Extent place from the T. of 45d. will fall on the T. 6d. 48 min. required.

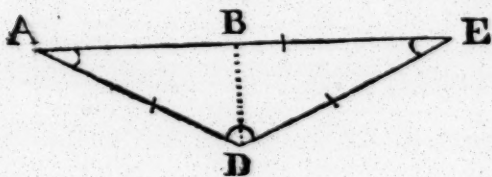
For the Distance of the Ships.

The Extent from the Sine of 57d. 25m. to the Sine of 78d. 45m. will reach from 140 min. to 163 min.

P R O B. IV. Three Sides being given, to find an Angle.

Example. Suppose there are two Ports both in one Latitude, distant 536 Miles, a Ship sails from the Eastermost 306 Miles, between the South and the West: Another Ship sails from the Westermost 290 Miles, and meets with the first Ship. The Course that each Ship hath steer'd is required.

Let A and E represent the two Ports, D the place where the Ships meet.



This Question is resolved by letting fall a Perpendicular DB, reducing the Oblique Triangle ADE, into the two Right-angled Triangles ABD and BDE, then the Operation is as follows,

First, find the Segment of the Base BE, thus,

As the Base AE, 536 Miles — Co. Ar. 7.270835
 To the Sum of the Sides AD and ED 596 Miles — 2.775246
 So is the Difference of the said sides 16 Miles — 1.204120
 To a Segment of the Base, which is $17\frac{2}{5}$ Miles — 11.250201

The

Oblique Plain Sailing.

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The whole Base _____ 536 min.
 The Difference of the Segments is _____ $17 \frac{9}{17}$
 Sum is _____ $553 \frac{9}{17}$
 Half Sum _____ $276 \frac{9}{17}$ the greater Segment BE.

Then say, *For the first Ship's Course.*

As DE the first Ship's Distance 306 min. _____ 2.485721
 To Radius. _____ 10.000000
 So is the greater Segment BE $276 \frac{9}{17}$ min. _____ 2.442323
 To Sc. BED 25d. 9m. _____ 9.956602

The Angle at E is the Course from the West Southerly, so the first Ship steers South $64^{\circ} 51'$ West, or S W by W. three quarters West almost.

For the second Ship's Course.

As AD the second Ship's Distance 290 min. _____ Co. Ar. 7.537602
 To Sine AED 25d. 9m. _____ 9.628378
 So is DE the first Ship's Distance 306 _____ 2.485721
 To Sine DAE 26d. 39m. _____ 9.651701

The Angle at A is the Course from the East Southerly, so the second Ship steers South 63° deg. 21 min. East, or S E by E. 3 quarters E. nearly.

By the Gunter. For the Difference of the Segments of the Base.

The Extent of the Compasses from the Base AE 536 min. to the Sum of the sides 596 min. will reach from the Difference of the sides 16, to the Difference of Segments of the Base $17 \frac{9}{17}$ min. with which proceed as before.

For the first Ship's Course.

The Extent from the Distance 306 min. to the greater Segment $276 \frac{9}{17}$ min. will reach from Radius or Sine 90d. to Sine 64° deg. 51 min. the Complement of BED 25 deg. 9 min. required.

For the second Ship's Course.

The Extent from 290 min. the second Ship's Distance, to 306 min. the first Ship's Distance, will reach from the Sine 25 deg. 9 min. to the Sine 26° deg. 39 min. the Angle at A required.

P R O B. V.

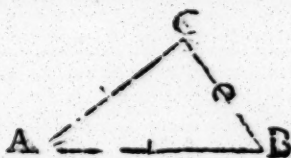
Two Sides and their contained Angle given, to find the third Side.

Example.

Two Ships sail from one Port at A; the first sails East 335 Miles to B; the second sails E. 14° deg. 40 min. North, 271 Miles to C. I demand how far they are asunder, and what is the Course from the Ship at C, to that at B?

In the Triangle ABC,
 there is given,

AB 335
 AC 271
 BAC $14^{\circ} 40'$ } BC required.



This

This Case requires a double Operation.

1. By the 3d Case to find the Angles.
2. By the first Case to find the Side required.

AB	335
AC	271
Sum is	606
Dift. is	64

The first Operation.

As the Sum of the Sides AB and AC 606 Miles	Co. Ar.	7.217527
To their Difference 64		1.806180
So is the t. of half Sum of the Angles 82° 40'		10.890441
To t. half their Difference 39° 22'		19.914148
By which you will find the Angle ABC, to be 43 deg. 18 min		

The second Operation.

As S. ABC 43d. 18m.	Co. Ar.	0.163791
To the Side AC 271 Miles		2.432969
So is S. BAC 14 deg. 40 min.		9.403455
To Side BC 100 Miles		12.000215

The Angle at B is found to be 43 deg. 18 min. therefore the Line AB being East and West, the Course from C to B is East 43 deg. 18 min. S. or S. E. 1 deg. 42 min. Easterly. And the Distance 100 Miles.

By the Gunter, for the Angle at B.

The Extent from 606 Miles the Sum of the Sides, to 64 Miles the Difference of the sides, will reach from the Tang. of 82d. 40m. half the Sum of the unknown Angles; to the Tang. of 39 deg 22m. half their Difference, which being found, proceed as above to find the Angle at B.

Then the Extent from S. 43d. 18m. the Angle at B, to S. 14d. 40m. the Angle at A; will reach from 271 Miles the side AC, to 100 Miles, the side BC, as above.

Thus much for Sailing by the *Plain Chart*; which being of some Use in short Voyages, and a good Foundation for further Improvement, we were not willing wholly to omit it; but nevertheless would advise all that take Charge of Ships never to content themselves with the Use of the *Plain Chart* only; being so apparently false in it self, and so unsafe for Practice: Nor are we under any Necessity to trust to it, the Defect thereof being now sufficiently supplied by Mr. *Wright's* True Chart, commonly called *Mercator's*, the Projection and Use of which (both in single Questions and Traverses) is largely treated of and rendered as easy as the *Plain Chart*, in the Book called *Practical Navigation*, first set forth by Mr. *John Seller*, and now Corrected and Reprinted for Messieurs *Mounts* and *Page* on *Tower-Hill*, with many useful Additions.

A Large and very Useful

TABLE
OF
DIFFERENCE
OF
Latitude and Departure
IN
MINUTES and Tenth Parts,
TO
Every Degree and Quarter-Point
OF THE
COMPASS,
For the exact Working of a
TRAVERSE:

LONDON: Printed for W. and J. MOUNT and
T. PAGE, on *Tower-Hill*.

Diff.	1 Deg.		2 Deg.		$\frac{1}{4}$ Point		3 Deg.		4 Deg.		5 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.0	01.0	00.0	01.0	00.0	01.0	00.1	01.0	00.1	01.0	00.1	1
2	02.0	00.0	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.1	02.0	00.2	2
3	03.0	00.1	03.0	00.1	03.0	00.1	03.0	00.2	03.0	00.2	03.0	00.3	3
4	04.0	00.1	04.0	00.1	04.0	00.2	04.0	00.2	04.0	00.3	04.0	00.3	4
5	05.0	00.1	05.0	00.2	05.0	00.2	05.0	00.3	05.0	00.3	05.0	00.4	5
6	06.0	00.1	06.0	00.2	06.0	00.3	05.0	00.3	06.0	00.4	06.0	00.5	6
7	07.0	00.1	07.0	00.2	07.0	00.3	07.0	00.4	07.0	00.5	07.0	00.6	7
8	08.0	00.1	08.0	00.3	08.0	00.4	08.0	00.4	08.0	00.6	08.0	00.7	8
9	09.0	00.2	09.0	00.3	09.0	00.4	09.0	00.5	09.0	00.6	09.0	00.8	9
10	10.0	00.2	10.0	00.4	10.0	00.5	10.0	00.5	10.0	00.7	10.0	00.9	10
11	11.0	00.2	11.0	00.4	11.0	00.5	11.0	00.6	11.0	00.8	11.0	01.0	11
12	12.0	00.2	12.0	00.4	12.0	00.6	12.0	00.6	12.0	00.8	12.0	01.0	12
13	13.0	00.2	13.0	00.5	13.0	00.6	13.0	00.7	13.0	00.9	12.9	01.1	13
14	14.0	00.2	14.0	00.5	14.0	00.7	14.0	00.7	14.0	01.0	13.9	01.2	14
15	15.0	00.3	15.0	00.5	15.0	00.7	15.0	00.8	15.0	01.0	14.9	01.3	15
16	16.0	00.3	16.0	00.6	16.0	00.8	16.0	00.8	16.0	01.1	15.9	01.4	16
17	17.0	00.3	17.0	00.6	17.0	00.8	17.0	00.9	17.0	01.2	16.9	01.5	17
18	18.0	00.3	18.0	00.6	18.0	00.9	18.0	00.9	18.0	01.3	17.9	01.6	18
19	19.0	00.3	19.0	00.7	19.0	00.9	19.0	01.0	19.0	01.3	18.9	01.7	19
20	20.0	00.4	20.0	00.7	20.0	01.0	20.0	01.0	20.0	01.4	19.9	01.7	20
21	21.0	00.4	21.0	00.7	21.0	01.0	21.0	01.1	20.9	01.5	20.9	01.8	21
22	22.0	00.4	22.0	00.8	22.0	01.1	22.0	01.1	21.9	01.5	21.9	01.9	22
23	23.0	00.4	23.0	00.8	23.0	01.1	23.0	01.2	22.9	01.6	22.9	02.0	23
24	24.0	00.4	24.0	00.8	24.0	01.2	24.0	01.3	23.9	01.7	23.9	02.1	24
25	25.0	00.4	25.0	00.9	25.0	01.2	25.0	01.3	24.9	01.7	24.9	02.2	25
26	26.0	00.5	26.0	00.9	26.0	01.3	26.0	01.4	25.9	01.8	25.9	02.3	26
27	27.0	00.5	27.0	00.9	27.0	01.3	27.0	01.4	26.9	01.9	26.9	02.4	27
28	28.0	00.5	28.0	01.0	28.0	01.4	28.0	01.5	27.9	02.0	27.9	02.4	28
29	29.0	00.5	29.0	01.0	29.0	01.4	29.0	01.5	28.9	02.0	28.9	02.5	29
30	30.0	00.5	30.0	01.1	30.0	01.5	30.0	01.6	29.9	02.1	29.9	02.6	30
31	31.0	00.5	31.0	01.1	31.0	01.5	31.0	01.6	30.9	02.2	30.9	02.7	31
32	32.0	00.6	32.0	01.1	32.0	01.6	32.0	01.7	31.9	02.2	31.9	02.8	32
33	33.0	00.6	33.0	01.2	33.0	01.6	33.0	01.7	32.9	02.3	32.9	02.9	33
34	34.0	00.6	34.0	01.2	34.0	01.7	34.0	01.8	33.9	02.4	33.9	03.0	34
35	35.0	00.6	35.0	01.2	35.0	01.7	35.0	01.8	34.9	02.4	34.9	03.1	35
36	36.0	00.6	36.0	01.3	36.0	01.8	35.9	01.9	35.9	02.5	35.9	03.1	36
37	37.0	00.6	37.0	01.3	37.0	01.8	36.9	01.9	36.9	02.6	36.9	03.2	37
38	38.0	00.7	38.0	01.3	38.0	01.9	37.9	02.0	37.9	02.7	37.9	03.3	38
39	39.0	00.7	39.0	01.4	39.0	01.9	38.9	02.0	38.9	02.7	38.9	03.4	39
40	40.0	00.7	40.0	01.4	40.0	02.0	39.9	02.1	39.9	02.8	39.8	03.5	40
41	41.0	00.7	41.0	01.4	41.0	02.0	40.9	02.1	40.9	02.9	40.8	03.6	41
42	42.0	00.7	42.0	01.5	41.9	02.1	41.9	02.2	41.9	02.9	41.8	03.7	42
43	43.0	00.8	43.0	01.5	42.9	02.1	42.9	02.2	42.9	03.0	42.8	03.8	43
44	44.0	00.8	44.0	01.5	43.9	02.2	43.9	02.3	43.9	03.1	43.8	03.8	44
45	45.0	00.8	45.0	01.6	44.9	02.2	44.9	02.4	44.9	03.1	44.8	03.9	45
46	46.0	00.8	46.0	01.6	45.9	02.3	45.9	02.4	45.9	03.2	45.8	04.0	46
47	47.0	00.8	47.0	01.6	46.9	02.3	46.9	02.5	46.9	03.3	46.8	04.1	47
48	48.0	00.8	48.0	01.7	47.9	02.4	47.9	02.5	47.9	03.4	47.8	04.2	48
49	49.0	00.9	49.0	01.7	48.9	02.4	48.9	02.6	48.9	03.4	48.8	04.3	49
50	50.0	00.9	50.0	01.7	49.9	02.5	49.9	02.6	49.9	03.5	49.8	04.4	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	89 Deg.		88 Deg.		7 $\frac{1}{4}$ Point		87 Deg.		86 Deg.		85 Deg.		

Of LATITUDE and DEPARTURE,

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Dist.	1 Deg.		2 Deg.		4 Point		3 Deg.		4 Deg.		5 Deg.		Dist.
	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	
51	51,0	00,9	51,0	01,8	50,9	02,5	50,9	02,7	50,9	03,6	50,8	04,4	51
52	52,0	00,9	52,0	01,8	51,9	02,6	51,9	02,7	51,9	03,6	51,8	04,5	52
53	53,0	00,9	53,0	01,8	52,9	02,6	52,9	02,8	52,9	03,7	52,8	04,6	53
54	54,0	00,9	54,0	01,9	53,9	02,7	53,9	02,8	53,9	03,8	53,8	04,7	54
55	55,0	01,0	55,0	01,9	54,9	02,7	54,9	02,8	54,9	03,8	54,8	04,8	55
56	56,0	01,0	56,0	02,0	55,9	02,7	55,9	02,9	55,9	03,9	55,8	04,9	56
57	57,0	01,0	57,0	02,0	56,9	02,8	56,9	03,0	56,9	04,0	56,8	05,0	57
58	58,0	01,0	58,0	02,0	57,9	02,8	57,9	03,0	57,9	04,0	57,8	05,1	58
59	59,0	01,0	59,0	02,1	58,9	02,9	58,9	03,1	58,9	04,1	58,8	05,1	59
60	60,0	01,1	60,0	02,1	59,9	02,9	59,9	03,1	59,9	04,2	59,8	05,2	60
61	61,0	01,1	61,0	02,1	60,9	03,0	60,9	03,2	60,9	04,3	60,8	05,3	61
62	62,0	01,1	62,0	02,2	61,9	03,0	61,9	03,2	61,9	04,3	61,8	05,4	62
63	63,0	01,1	63,0	02,2	62,9	03,1	62,9	03,3	62,8	04,4	62,8	05,5	63
64	64,0	01,1	64,0	02,2	63,9	03,1	63,9	03,3	63,8	04,5	63,8	05,6	64
65	65,0	01,1	65,0	02,3	64,9	03,2	64,9	03,4	64,8	04,5	64,8	05,7	65
66	66,0	01,2	66,0	02,3	65,9	03,2	65,9	03,5	65,8	04,6	65,7	05,8	66
67	67,0	01,2	67,0	02,3	66,9	03,3	66,9	03,5	66,8	04,7	66,7	05,8	67
68	68,0	01,2	68,0	02,4	67,9	03,3	67,9	03,6	67,8	04,7	67,7	05,9	68
69	69,0	01,2	69,0	02,4	68,9	03,4	68,9	03,6	68,8	04,8	68,7	06,0	69
70	70,0	01,2	70,0	02,4	69,9	03,4	69,9	03,7	69,8	04,9	69,7	06,1	70
71	71,0	01,2	71,0	02,5	70,9	03,5	70,9	03,7	70,8	05,0	70,7	06,2	71
72	72,0	01,3	72,0	02,5	71,9	03,5	71,9	03,8	71,8	05,1	71,7	06,3	72
73	73,0	01,3	73,0	02,5	72,9	03,6	72,9	03,8	72,8	05,1	72,7	06,4	73
74	74,0	01,3	74,0	02,6	73,9	03,6	73,9	03,9	73,8	05,2	73,7	06,5	74
75	75,0	01,3	75,0	02,6	74,9	03,7	74,9	03,9	74,8	05,2	74,7	06,5	75
76	76,0	01,3	76,0	02,7	75,9	03,7	75,9	04,0	75,8	05,3	75,7	06,6	76
77	77,0	01,3	77,0	02,7	76,9	03,8	76,9	04,0	76,8	05,4	76,7	06,7	77
78	78,0	01,4	78,0	02,7	77,9	03,8	77,9	04,1	77,8	05,4	77,7	06,8	78
79	79,0	01,4	79,0	02,8	78,9	03,9	78,9	04,1	78,8	05,5	78,7	06,9	79
80	80,0	01,4	80,0	02,8	79,9	03,9	79,9	04,2	79,8	05,6	79,7	07,0	80
81	81,0	01,4	81,0	02,8	80,9	04,0	80,9	04,2	80,8	05,7	80,7	07,1	81
82	82,0	01,4	81,9	02,9	81,9	04,0	81,9	04,3	81,8	05,7	81,7	07,2	82
83	83,0	01,5	82,9	02,9	82,9	04,1	82,9	04,3	82,8	05,8	82,7	07,2	83
84	84,0	01,5	83,9	02,9	83,9	04,1	83,9	04,4	83,8	05,9	83,7	07,3	84
85	85,0	01,5	84,9	03,0	84,9	04,2	84,9	04,4	84,8	05,9	84,7	07,4	85
86	86,0	01,5	85,9	03,0	85,9	04,2	85,9	04,5	85,8	06,0	85,7	07,5	86
87	87,0	01,5	86,9	03,0	86,9	04,3	86,9	04,6	86,8	06,1	86,7	07,6	87
88	88,0	01,5	87,9	03,1	87,9	04,3	87,9	04,6	87,8	06,1	87,7	07,7	88
89	89,0	01,6	88,9	03,1	88,9	04,4	88,9	04,7	88,8	06,2	88,7	07,8	89
90	90,0	01,6	89,9	03,1	89,9	04,4	89,9	04,7	89,8	06,3	89,7	07,8	90
91	91,0	01,6	90,9	03,2	90,9	04,5	90,9	04,8	90,8	06,4	90,7	07,9	91
92	92,0	01,6	91,9	03,2	91,9	04,5	91,9	04,8	91,8	06,4	91,7	08,0	92
93	93,0	01,6	92,9	03,2	92,9	04,6	92,9	04,9	92,8	06,5	92,7	08,1	93
94	94,0	01,6	93,9	03,3	93,9	04,6	93,9	04,9	93,8	06,6	93,7	08,2	94
95	95,0	01,7	94,9	03,3	94,9	04,7	94,9	05,0	94,8	06,6	94,7	08,3	95
96	96,0	01,7	95,9	03,4	95,9	04,7	95,9	05,0	95,8	06,7	95,7	08,4	96
97	97,0	01,7	96,9	03,4	96,9	04,8	96,9	05,1	96,8	06,8	96,7	08,5	97
98	98,0	01,7	97,9	03,4	97,9	04,8	97,9	05,1	97,8	06,8	97,7	08,5	98
99	99,0	01,7	98,9	03,5	98,9	04,9	98,9	05,2	98,8	06,9	98,7	08,6	99
100	100,0	01,7	99,9	03,5	99,9	04,9	99,9	05,2	99,8	07,0	99,7	08,6	100
Dist.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dep.	Lat.	Dist.
89 Deg.			88 Deg.		7 1/2 Points		87 Deg.		86 Deg.		85 Deg.		

Diff.	$\frac{1}{2}$ Point		6 Deg.		7 Deg.		8 Deg.		$\frac{3}{4}$ Point		9 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.1	01.0	00.2	1
2	02.0	00.2	02.0	00.2	02.0	00.2	02.0	00.3	02.0	00.3	02.0	00.3	2
3	03.0	00.3	03.0	00.3	03.0	00.4	03.0	00.4	03.0	00.4	03.0	00.5	3
4	04.0	00.4	04.0	00.4	04.0	00.5	04.0	00.6	04.0	00.6	03.9	00.6	4
5	05.0	00.5	05.0	00.5	05.0	00.6	05.0	00.7	04.9	00.7	04.9	00.8	5
6	06.0	00.6	06.0	00.6	06.0	00.7	05.9	00.8	05.9	00.9	05.9	00.9	6
7	07.0	00.7	07.0	00.7	06.9	00.9	05.9	01.0	06.9	01.0	06.9	01.1	7
8	08.0	00.8	08.0	00.8	07.9	01.0	07.9	01.1	07.9	01.2	07.9	01.3	8
9	09.0	00.9	08.9	00.9	08.9	01.1	08.9	01.2	08.9	01.3	08.9	01.4	9
10	10.0	01.0	09.9	01.0	09.9	01.2	09.9	01.4	09.9	01.5	09.9	01.6	10
11	10.9	01.1	10.9	01.1	10.9	01.3	10.9	01.5	10.9	01.6	10.9	01.7	11
12	11.9	01.2	11.9	01.3	11.9	01.5	11.9	01.7	11.9	01.8	11.9	01.9	12
13	12.9	01.3	12.9	01.4	12.9	01.6	12.9	01.8	12.9	01.9	12.8	02.0	13
14	13.9	01.4	13.9	01.5	13.9	01.7	13.9	01.9	13.8	02.1	13.8	02.2	14
15	14.9	01.5	14.9	01.6	14.9	01.8	14.9	02.1	14.8	02.2	14.8	02.3	15
16	15.9	01.6	15.9	01.7	15.9	01.9	15.8	02.2	15.8	02.3	15.8	02.5	16
17	16.9	01.7	16.9	01.8	16.9	02.1	16.8	02.4	16.8	02.5	16.8	02.7	17
18	17.9	01.8	17.9	01.9	17.9	02.2	17.8	02.5	17.8	02.6	17.8	02.8	18
19	18.9	01.9	18.9	02.0	18.9	02.3	18.8	02.6	18.8	02.8	18.8	03.0	19
20	19.9	02.0	19.9	02.1	19.8	02.4	19.8	02.8	19.8	02.9	19.8	03.1	20
21	20.9	02.1	20.9	02.2	20.8	02.6	20.8	02.9	20.8	03.1	20.7	03.3	21
22	21.9	02.2	21.9	02.3	21.8	02.7	21.8	03.1	21.8	03.2	21.7	03.4	22
23	22.9	02.3	22.9	02.4	22.8	02.8	22.8	03.2	22.8	03.4	22.7	03.6	23
24	23.9	02.4	23.9	02.5	23.8	02.9	23.8	03.3	23.7	03.5	23.7	03.8	24
25	24.9	02.4	24.9	02.6	24.8	03.0	24.8	03.5	24.7	03.7	24.7	03.9	25
26	25.9	02.5	25.9	02.7	25.8	03.2	25.7	03.7	25.7	03.8	25.7	04.1	26
27	26.9	02.6	26.9	02.8	26.8	03.3	26.7	03.8	26.7	04.0	26.7	04.2	27
28	27.9	02.7	27.8	02.9	27.8	03.4	27.7	03.9	27.7	04.1	27.7	04.4	28
29	28.9	02.8	28.8	03.0	28.8	03.5	28.7	04.0	28.7	04.3	28.6	04.5	29
30	29.9	02.9	29.8	03.1	29.8	03.7	29.7	04.2	29.7	04.4	29.6	04.7	30
31	30.9	03.0	30.8	03.2	30.8	03.8	30.7	04.3	30.7	04.5	30.6	04.9	31
32	31.8	03.1	31.8	03.3	31.8	03.9	31.7	04.5	31.7	04.7	31.6	05.1	32
33	32.8	03.2	32.8	03.4	32.8	04.0	32.7	04.6	32.0	04.8	32.6	05.2	33
34	33.8	03.3	33.8	03.6	33.7	04.1	33.7	04.7	33.6	05.0	33.6	05.4	34
35	34.8	03.4	34.8	03.7	34.7	04.3	34.7	04.9	34.6	05.1	34.6	05.5	35
36	35.8	03.5	35.8	03.8	35.7	04.4	35.6	05.0	35.6	05.3	35.6	05.6	36
37	36.8	03.6	36.8	03.9	36.7	04.5	36.6	05.1	36.6	05.4	36.5	05.8	37
38	37.8	03.7	37.8	04.0	37.7	04.6	37.6	05.3	37.6	05.6	37.5	05.9	38
39	38.8	03.8	38.8	04.1	38.7	04.8	38.6	05.4	38.6	05.7	38.5	06.1	39
40	39.8	03.9	39.8	04.2	39.7	04.9	39.6	05.6	39.6	05.9	39.5	06.3	40
41	40.8	04.0	40.8	04.3	40.7	05.0	40.6	05.7	40.6	06.0	40.5	06.4	41
42	41.8	04.1	41.8	04.4	41.7	05.1	41.6	05.8	41.5	06.2	41.5	06.6	42
43	42.8	04.2	42.8	04.5	42.7	05.2	42.6	06.0	42.5	06.3	42.5	06.7	43
44	43.8	04.3	43.8	04.6	43.7	05.4	43.6	06.1	43.5	06.5	43.5	06.9	44
45	44.8	04.4	44.8	04.7	44.7	05.5	44.6	06.3	44.5	06.6	44.4	07.0	45
46	45.8	04.5	45.7	04.8	45.7	05.6	45.6	06.4	45.5	06.7	45.4	07.2	46
47	46.8	04.6	46.7	04.9	46.6	05.7	46.5	06.6	46.5	06.9	46.4	07.3	47
48	47.8	04.7	47.7	05.0	47.6	05.9	47.5	06.7	47.5	07.0	47.4	07.5	48
49	48.8	04.8	48.7	05.1	48.6	06.0	48.5	06.8	48.5	07.2	48.4	07.7	49
50	49.8	04.9	49.7	05.2	49.6	06.1	49.5	07.0	49.5	07.3	49.4	07.8	50
Diff.	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	$\frac{1}{2}$ Point		84 Deg.		83 Deg.		82 Deg.		$7\frac{1}{2}$ Point		81 Deg.		

Of LATITUDE *and* DEPARTURE.

93

Dist.	$\frac{1}{2}$ Point		6 Deg.		7 Deg.		8 Deg.		$\frac{1}{2}$ Point		9 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.8	05.0	50.7	05.3	50.6	06.2	50.5	07.1	50.4	07.5	50.4	08.0	51
52	51.7	05.1	51.7	05.4	51.6	06.3	51.5	07.2	51.4	07.6	51.4	08.1	52
53	52.7	05.2	52.7	05.5	52.6	06.5	52.5	07.4	52.4	07.8	52.3	08.3	53
54	53.7	05.3	53.7	05.6	53.6	06.6	53.5	07.5	53.4	07.9	53.3	08.4	54
55	54.7	05.4	54.7	05.7	54.6	06.7	54.5	07.7	54.4	08.1	54.3	08.6	55
56	55.7	05.5	55.7	05.9	55.6	06.8	55.5	07.8	55.4	08.2	55.3	08.7	56
57	56.7	05.6	55.7	06.0	55.6	06.9	56.4	07.9	56.4	08.4	56.3	08.9	57
58	57.7	05.7	57.7	06.1	57.6	07.1	57.4	08.1	57.4	08.5	57.3	09.1	58
59	58.7	05.8	58.7	06.2	58.6	07.2	58.4	08.2	58.4	08.7	58.3	09.2	59
60	59.7	05.9	59.7	06.3	59.5	07.3	59.4	08.4	59.4	08.8	59.3	09.4	60
61	60.7	06.0	60.7	06.4	60.5	07.4	60.4	08.5	60.3	08.9	60.2	09.5	61
62	61.7	06.1	61.7	06.5	61.5	07.6	61.4	08.6	61.3	09.1	61.2	09.7	62
63	62.7	06.2	62.7	06.6	62.5	07.7	62.4	08.8	62.3	09.2	62.2	09.9	63
64	63.7	06.3	63.6	06.7	63.5	07.8	63.4	08.9	63.3	09.4	63.2	10.0	64
65	64.7	06.4	64.6	06.8	64.5	07.9	64.4	09.0	64.3	09.5	64.2	10.2	65
66	65.7	06.5	65.6	06.9	65.5	08.0	65.4	09.2	65.3	09.7	65.2	10.3	66
67	66.7	06.6	66.6	07.0	66.5	08.2	66.3	09.3	66.3	09.8	66.2	10.5	67
68	67.7	06.7	67.6	07.1	67.5	08.3	67.3	09.3	67.3	10.0	67.2	10.6	68
69	68.7	06.8	68.6	07.2	68.5	08.4	68.3	09.6	68.3	10.1	68.2	10.8	69
70	69.7	06.9	69.6	07.3	69.5	08.5	69.3	09.7	69.2	10.3	69.1	10.9	70
71	70.7	07.0	70.6	07.4	70.5	08.7	70.3	09.9	70.2	10.4	70.1	11.1	71
72	71.7	07.1	71.6	07.5	71.5	08.8	71.3	10.0	71.2	10.6	71.1	11.3	72
73	72.6	07.2	72.6	07.6	72.5	08.9	72.3	10.2	72.2	10.7	72.1	11.4	73
74	73.6	07.3	73.6	07.7	73.4	09.0	73.3	10.3	73.2	10.9	73.1	11.6	74
75	74.6	07.3	74.6	07.8	74.4	09.1	74.3	10.4	74.2	11.0	74.1	11.7	75
76	75.6	07.4	75.6	07.9	75.4	09.3	75.3	10.6	75.2	11.1	75.1	11.9	76
77	76.6	07.5	76.6	08.0	76.4	09.4	76.2	10.7	76.2	11.3	76.1	12.0	77
78	77.6	07.6	77.6	08.1	77.4	09.5	77.2	10.9	77.2	11.4	77.0	12.2	78
79	78.6	07.7	78.6	08.3	78.4	09.6	78.2	11.0	78.1	11.6	78.0	12.4	79
80	79.6	07.8	79.6	08.4	79.4	09.8	79.2	11.1	79.1	11.7	79.0	12.5	80
81	80.6	07.9	80.6	08.5	80.4	09.9	80.2	11.3	80.1	11.9	80.0	12.7	81
82	81.6	08.0	81.5	08.6	81.4	10.0	81.2	11.4	81.1	12.0	81.0	12.8	82
83	82.6	08.1	82.5	08.7	82.4	10.1	82.2	11.6	82.1	12.2	82.0	13.0	83
84	83.6	08.2	83.5	08.8	83.4	10.2	83.2	11.7	83.1	12.3	83.0	13.1	84
85	84.6	08.3	84.5	08.9	84.4	10.4	84.2	11.8	84.1	12.5	84.0	13.3	85
86	85.6	08.4	85.5	09.0	85.4	10.5	85.2	12.0	85.1	12.6	84.9	13.4	86
87	86.6	08.5	86.5	09.1	86.3	10.6	86.2	12.1	86.0	12.8	85.9	13.6	87
88	87.6	08.6	87.5	09.2	87.3	10.7	87.1	12.2	87.0	12.9	86.9	13.8	88
89	88.6	08.7	88.5	09.3	88.3	10.8	88.1	12.4	88.0	13.1	87.9	13.9	89
90	89.6	08.8	89.5	09.4	89.3	11.0	89.1	12.5	89.0	13.2	88.9	14.1	90
91	90.6	08.9	90.5	09.5	90.3	11.1	90.1	12.7	90.0	13.3	89.9	14.2	91
92	91.6	09.0	91.5	09.6	91.3	11.2	91.1	12.8	91.0	13.5	90.9	14.4	92
93	92.6	09.1	92.5	09.7	92.3	11.3	92.1	12.9	92.0	13.6	91.9	14.5	93
94	93.5	09.2	93.5	09.8	93.3	11.5	93.1	13.1	93.0	13.8	92.8	14.7	94
95	94.5	09.3	94.5	09.9	94.3	11.6	94.1	13.2	94.0	13.9	93.8	14.9	95
96	95.5	09.4	95.5	10.0	95.3	11.7	95.1	13.4	95.0	14.1	94.8	15.0	96
97	96.5	09.5	96.5	10.1	96.3	11.8	96.1	13.5	96.0	14.2	95.8	15.2	97
98	97.5	09.6	97.5	10.2	97.3	11.9	97.0	13.6	96.9	14.4	96.8	15.3	98
99	98.5	09.7	98.5	10.3	98.3	12.1	98.0	13.8	97.9	14.5	97.8	15.5	99
100	99.5	09.8	99.4	10.4	99.2	12.2	99.0	13.9	98.9	14.7	98.8	15.6	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	$\frac{1}{2}$ Point		84 Deg.		83 Deg.		82 Deg.		$\frac{1}{2}$ Point		81 Deg.		

Diff.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	01.0	00.2	1
2	02.0	00.3	02.0	00.4	02.0	00.4	02.0	00.4	01.9	00.4	01.9	00.5	2
3	03.0	00.5	02.9	00.6	02.9	00.6	02.9	00.6	02.9	00.7	02.9	00.7	3
4	03.9	00.7	03.9	00.8	03.9	00.8	03.9	00.8	03.9	00.9	03.9	01.0	4
5	04.9	00.9	04.9	01.0	04.9	01.0	04.9	01.0	04.9	01.1	04.9	01.2	5
6	05.9	01.0	05.9	01.1	05.9	01.2	05.9	01.2	05.8	01.3	05.8	01.4	6
7	06.9	01.2	06.9	01.3	06.9	01.4	06.8	01.5	06.8	01.6	06.8	01.7	7
8	07.9	01.4	07.9	01.5	07.8	01.6	07.8	01.7	07.8	01.8	07.8	01.9	8
9	08.9	01.6	08.8	01.7	08.8	01.8	08.8	01.9	08.8	02.0	08.7	02.2	9
10	09.8	01.7	09.8	01.9	09.8	02.0	09.8	02.1	09.7	02.2	09.7	02.4	10
11	10.8	01.9	10.8	02.1	10.8	02.1	10.8	02.3	10.7	02.5	10.7	02.7	11
12	11.8	02.1	11.8	02.3	11.8	02.3	11.7	02.5	11.7	02.7	11.6	02.9	12
13	12.8	02.3	12.8	02.5	12.7	02.5	12.7	02.7	12.7	02.9	12.6	03.1	13
14	13.8	02.4	13.7	02.7	13.7	02.7	13.7	02.9	13.6	03.1	13.6	03.4	14
15	14.8	02.6	14.7	02.9	14.7	02.9	14.7	03.1	14.6	03.4	14.6	03.6	15
16	15.8	02.8	15.7	03.1	15.7	03.1	15.6	03.3	15.6	03.6	15.5	03.9	16
17	16.7	03.0	16.7	03.2	16.7	03.3	16.6	03.5	16.6	03.8	16.5	04.1	17
18	17.7	03.1	17.7	03.4	17.7	03.5	17.6	03.7	17.5	04.0	17.5	04.4	18
19	18.7	03.3	18.6	03.6	18.6	03.7	18.6	03.9	18.5	04.3	18.4	04.6	19
20	19.7	03.5	19.6	03.8	19.6	03.9	19.6	04.2	19.5	04.5	19.4	04.8	20
21	20.7	03.6	20.6	04.0	20.6	04.1	20.5	04.4	20.5	04.7	20.4	05.1	21
22	21.7	03.8	21.6	04.2	21.6	04.3	21.5	04.6	21.4	04.9	21.3	05.3	22
23	22.6	04.0	22.6	04.4	22.6	04.5	22.5	04.8	22.4	05.2	22.3	05.6	23
24	23.6	04.2	23.6	04.6	23.5	04.7	23.5	05.0	23.4	05.4	23.3	05.8	24
25	24.6	04.3	24.5	04.8	24.5	04.9	24.5	05.2	24.4	05.6	24.3	06.0	25
26	25.6	04.5	25.5	05.0	25.5	05.1	25.4	05.4	25.3	05.8	25.2	06.3	26
27	26.6	04.7	26.5	05.2	26.5	05.3	26.4	05.6	26.3	06.1	26.2	06.5	27
28	27.6	04.9	27.5	05.3	27.5	05.5	27.4	05.8	27.3	06.3	27.2	06.8	28
29	28.6	05.0	28.5	05.5	28.4	05.7	28.4	06.0	28.3	06.5	28.1	07.0	29
30	29.5	05.2	29.4	05.7	29.4	05.9	29.3	06.2	29.2	06.7	29.1	07.3	30
31	30.5	05.4	30.4	05.9	30.4	06.0	30.3	06.4	30.2	07.0	30.1	07.5	31
32	31.5	05.6	31.4	06.1	31.4	06.2	31.3	06.7	31.2	07.2	31.0	07.7	32
33	32.5	05.7	32.4	06.3	32.4	06.4	32.3	06.9	32.2	07.4	32.0	08.0	33
34	33.5	05.9	33.4	06.5	33.3	06.6	33.3	07.1	33.1	07.6	33.0	08.2	34
35	34.5	06.1	34.4	06.7	34.3	06.8	34.2	07.3	34.1	07.9	34.0	08.5	35
36	35.4	06.2	35.3	06.9	35.3	07.0	35.2	07.5	35.1	08.1	34.9	08.7	36
37	36.4	06.4	36.3	07.1	36.3	07.2	36.2	07.7	36.1	08.3	35.9	09.0	37
38	37.4	06.6	37.3	07.2	37.3	07.4	37.2	07.9	37.0	08.5	36.9	09.2	38
39	38.4	06.8	38.3	07.4	38.3	07.6	38.1	08.1	38.0	08.8	37.8	09.4	39
40	39.4	06.9	39.3	07.6	39.2	07.8	39.1	08.3	39.0	09.0	38.8	09.7	40
41	40.4	07.1	40.2	07.8	40.2	08.0	40.1	08.5	39.9	09.2	39.8	09.9	41
42	41.4	07.3	41.2	08.0	41.2	08.2	41.1	08.7	40.9	09.4	40.8	10.2	42
43	42.3	07.5	42.2	08.2	42.2	08.4	42.1	08.9	41.9	09.7	41.7	10.4	43
44	43.3	07.6	43.2	08.4	43.2	08.6	43.0	09.1	42.9	09.9	42.7	10.6	44
45	44.3	07.8	44.2	08.6	44.1	08.8	44.0	09.4	43.8	10.1	43.7	10.9	45
46	45.3	08.0	45.2	08.8	45.1	09.0	45.0	09.6	44.8	10.3	44.6	11.1	46
47	46.3	08.2	46.1	09.0	46.1	09.2	46.0	09.8	45.8	10.6	45.6	11.4	47
48	47.3	08.3	47.1	09.2	47.1	09.4	47.0	10.0	46.8	10.8	46.6	11.6	48
49	48.3	08.5	48.1	09.3	48.1	09.6	47.9	10.2	47.7	11.0	47.5	11.9	49
50	49.3	08.7	49.1	09.5	49.0	09.8	48.9	10.4	48.7	11.2	48.5	12.1	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	79 Deg.	79 Points	78 Deg.	77 Deg.	76 Deg.								

Dist.	10 Deg.		11 Deg.		1 Point		12 Deg.		13 Deg.		14 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	50.2	08.9	50.1	09.7	50.0	10.0	49.9	10.6	49.7	11.5	49.5	12.3	51
52	51.2	09.0	51.0	09.9	51.0	10.1	50.9	10.8	50.7	11.7	50.5	12.6	52
53	52.2	09.2	52.0	10.1	52.0	10.3	51.8	11.0	51.6	11.9	51.4	12.8	53
54	53.2	09.4	53.0	10.3	53.0	10.5	52.8	11.2	52.6	12.1	52.4	13.1	54
55	54.2	09.5	54.0	10.5	53.9	10.7	53.8	11.4	53.6	12.4	53.4	13.3	55
56	55.1	09.7	55.0	10.7	54.9	10.9	54.8	11.6	54.6	12.6	54.3	13.5	56
57	56.1	09.9	56.0	10.9	55.9	11.1	55.8	11.8	55.5	12.8	55.3	13.8	57
58	57.1	10.1	56.9	11.1	56.9	11.3	56.7	12.1	56.5	13.0	56.3	14.0	58
59	58.1	10.2	57.9	11.3	57.9	11.5	57.7	12.3	57.5	13.3	57.2	14.3	59
60	59.1	10.4	58.9	11.4	58.8	11.7	58.7	12.5	58.5	13.5	58.2	14.5	60
61	60.1	10.6	59.9	11.6	59.8	11.9	59.7	12.7	59.4	13.7	59.2	14.8	61
62	61.1	10.8	60.9	11.8	60.8	12.1	60.6	12.9	60.4	13.9	60.2	15.0	62
63	62.0	10.9	61.8	12.0	61.8	12.3	61.6	13.1	61.4	14.2	61.1	15.2	63
64	63.0	11.1	62.8	12.2	62.8	12.5	62.6	13.3	62.4	14.4	62.1	15.5	64
65	64.0	11.3	63.8	12.4	63.8	12.7	63.6	13.5	63.3	14.6	63.1	15.7	65
66	65.0	11.5	64.8	12.6	64.7	12.9	64.6	13.7	64.3	14.8	64.0	16.0	66
67	66.0	11.6	65.8	12.8	65.7	13.1	65.5	13.9	65.3	15.1	65.0	16.2	67
68	67.0	11.8	66.7	13.0	66.7	13.3	66.5	14.1	66.3	15.3	66.0	16.4	68
69	68.0	12.0	67.7	13.2	67.7	13.5	67.5	14.3	67.2	15.5	66.9	16.7	69
70	68.9	12.2	68.7	13.4	68.7	13.7	68.5	14.6	68.2	15.7	67.9	16.9	70
71	69.9	12.3	69.7	13.5	69.6	13.9	69.4	14.8	69.2	16.0	68.9	17.2	71
72	70.9	12.5	70.7	13.7	70.6	14.0	70.4	15.0	70.2	16.2	69.9	17.4	72
73	71.9	12.7	71.7	13.9	71.6	14.2	71.4	15.2	71.1	16.4	70.8	17.7	73
74	72.9	12.8	72.6	14.1	72.6	14.4	72.4	15.4	72.1	16.6	71.8	17.9	74
75	73.9	13.0	73.6	14.3	73.6	14.6	73.4	15.6	73.1	16.9	72.8	18.1	75
76	74.8	13.2	74.6	14.5	74.5	14.8	74.3	15.8	74.1	17.1	73.7	18.4	76
77	75.8	13.4	75.6	14.7	75.5	15.0	75.3	16.0	75.0	17.3	74.7	18.6	77
78	76.8	13.5	76.6	14.9	76.5	15.2	76.3	16.2	76.0	17.5	75.7	18.9	78
79	77.8	13.7	77.5	15.1	77.5	15.4	77.3	16.4	77.0	17.8	76.7	19.1	79
80	78.8	13.9	78.5	15.3	78.5	15.6	78.2	16.6	78.0	18.0	77.6	19.4	80
81	79.8	14.1	79.5	15.5	79.4	15.8	79.2	16.8	78.9	18.2	78.6	19.6	81
82	80.8	14.2	80.5	15.6	80.4	16.0	80.2	17.0	79.9	18.4	79.6	19.8	82
83	81.7	14.4	81.5	15.8	81.4	16.2	81.2	17.3	80.9	18.7	80.5	20.1	83
84	82.7	14.6	82.5	16.0	82.4	16.4	82.2	17.5	81.8	18.9	81.5	20.3	84
85	83.7	14.8	83.4	16.2	83.4	16.6	83.1	17.7	82.8	19.1	82.5	20.6	85
86	84.7	14.9	84.4	16.4	84.3	16.8	84.1	17.9	83.7	19.3	83.4	20.8	86
87	85.7	15.1	85.4	16.6	85.3	17.0	85.1	18.1	84.7	19.6	84.4	21.0	87
88	86.7	15.3	86.4	16.8	86.3	17.2	86.1	18.3	85.7	19.8	85.4	21.3	88
89	87.6	15.4	87.4	17.0	87.3	17.4	87.1	18.5	86.7	20.0	86.4	21.5	89
90	88.6	15.6	88.3	17.2	88.3	17.6	88.0	18.7	87.7	20.2	87.3	21.8	90
91	89.6	15.8	89.3	17.4	89.3	17.8	89.0	18.8	88.7	20.5	88.3	22.0	91
92	90.6	16.0	90.3	17.6	90.2	17.9	90.0	19.1	89.6	20.7	89.3	22.3	92
93	91.6	16.1	91.3	17.7	91.2	18.1	91.0	19.3	90.6	20.9	90.3	22.5	93
94	92.6	16.3	92.3	17.9	92.2	18.3	91.9	19.5	91.6	21.1	91.2	22.7	94
95	93.6	16.5	93.3	18.1	93.2	18.5	92.9	19.7	92.6	21.4	92.2	23.0	95
96	94.5	16.7	94.2	18.3	94.2	18.7	93.9	20.0	93.5	21.6	93.1	23.2	96
97	95.5	16.8	95.2	18.5	95.1	18.9	94.9	20.2	94.5	21.8	94.1	23.4	97
98	96.5	17.0	96.2	18.7	96.1	19.1	95.9	20.4	95.5	22.0	95.1	23.6	98
99	97.5	17.2	97.2	18.9	97.1	19.3	96.8	20.6	96.5	22.3	96.1	23.8	99
100	98.5	17.4	98.2	19.1	98.1	19.5	97.8	20.8	97.4	22.5	97.0	24.0	100
	Dep Lat		Dep Lat		Dep Lat		Dep Lat		Dep Lat		Dep Lat		
	80 Deg.		79 Deg.		7 Points		78 Deg.		77 Deg.		76 Deg.		

Diff.	1 $\frac{1}{4}$ Point		15 Deg.		16 Deg.		1 $\frac{1}{4}$ Point		17 Deg.		18 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.7	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.5	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.8	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.4	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	11.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
51	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	51
52	Point		53	Deg.	54	Deg.	55	Point	56	Deg.	57	Deg.	58

Of LATITUDE and DEPARTURE,

97

Diff.	14 Point		15 Deg.		16 Deg.		14 Point		17 Deg.		18 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.1	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	50.0	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55.3	13.9	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.8	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.3	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.3	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.0	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.1	62
63	61.1	15.3	60.9	16.3	60.6	17.4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.6	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.3	64.4	18.5	64.1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20.5	66.6	21.6	70
71	68.9	17.3	68.6	18.4	68.3	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.1	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.9	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.2	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.1	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.4	73.6	22.5	73.2	23.8	77
78	75.7	19.0	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.2	80.2	21.5	79.8	22.9	79.4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.7	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.4	21.1	84.0	22.5	83.6	24.0	83.3	25.3	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84.6	24.3	84.2	25.5	84.2	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.6	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.4	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	29.0	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	27.6	90.8	27.8	90.4	29.4	95
96	93.1	23.3	92.7	24.8	92.3	26.5	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.7	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30.9	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	64 Point	75 Deg.	74 Deg.	64 Point	75 Deg.	74 Deg.	64 Point	75 Deg.	74 Deg.	64 Point	75 Deg.	74 Deg.	

Diff.	14 Point		15 Deg.		16 Deg.		14 Point		17 Deg.		18 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	01.0	00.2	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	01.0	00.3	1
2	01.9	00.5	01.9	00.5	01.9	00.5	01.9	00.6	01.9	00.6	01.9	00.6	2
3	02.9	00.7	02.9	00.8	02.9	00.8	02.9	00.9	02.9	00.9	02.9	00.9	3
4	03.9	01.0	03.9	01.0	03.8	01.1	03.8	01.2	03.8	01.2	03.8	01.2	4
5	04.8	01.2	04.8	01.3	04.8	01.4	04.8	01.5	04.8	01.5	04.8	01.5	5
6	05.8	01.5	05.8	01.5	05.7	01.7	05.7	01.7	05.7	01.8	05.7	01.9	6
7	06.8	01.7	06.8	01.8	06.7	01.9	06.7	02.0	06.7	02.0	06.7	02.2	7
8	07.8	01.9	07.7	02.1	07.7	02.2	07.7	02.3	07.6	02.3	07.6	02.5	8
9	08.7	02.2	08.7	02.3	08.7	02.5	08.6	02.6	08.6	02.6	08.6	02.8	9
10	09.7	02.4	09.7	02.6	09.6	02.8	09.6	02.9	09.6	02.9	09.5	03.1	10
11	10.7	02.7	10.6	02.8	10.6	03.0	10.5	03.2	10.5	03.2	10.5	03.4	11
12	11.6	02.9	11.6	03.1	11.5	03.3	11.5	03.5	11.5	03.5	11.4	03.7	12
13	12.6	03.2	12.6	03.4	12.5	03.6	12.4	03.8	12.4	03.8	12.4	04.0	13
14	13.6	03.4	13.5	03.6	13.5	03.9	13.4	04.1	13.4	04.1	13.3	04.3	14
15	14.5	03.6	14.5	03.9	14.4	04.1	14.4	04.4	14.3	04.4	14.3	04.6	15
16	15.5	03.9	15.5	04.1	15.4	04.4	15.3	04.6	15.3	04.7	15.2	04.9	16
17	16.5	04.1	16.4	04.4	16.3	04.7	16.3	04.9	16.3	05.0	16.2	05.3	17
18	17.5	04.4	17.4	04.7	17.3	05.0	17.2	05.2	17.2	05.3	17.1	05.6	18
19	18.4	04.6	18.4	04.9	18.3	05.2	18.2	05.5	18.2	05.6	18.1	05.9	19
20	19.4	04.9	19.3	05.2	19.2	05.5	19.1	05.8	19.1	05.8	19.0	06.2	20
21	20.4	05.1	20.3	05.4	20.2	05.8	20.1	06.1	20.1	06.1	20.0	06.5	21
22	21.3	05.3	21.2	05.7	21.1	06.1	21.1	06.4	21.0	06.4	20.9	06.8	22
23	22.3	05.6	22.2	06.0	22.1	06.3	22.0	06.7	22.0	06.7	21.9	07.1	23
24	23.3	05.8	23.2	06.2	23.1	06.6	23.0	07.0	22.9	07.0	22.8	07.4	24
25	24.2	06.1	24.1	06.5	24.0	06.9	23.9	07.3	23.9	07.3	23.8	07.7	25
26	25.2	06.3	25.1	06.7	25.0	07.2	24.9	07.5	24.9	07.6	24.7	08.0	26
27	26.2	06.6	26.1	07.0	26.0	07.4	25.8	07.8	25.8	07.9	25.7	08.3	27
28	27.2	06.6	27.0	07.2	26.9	07.7	26.8	08.1	26.8	08.2	26.6	08.7	28
29	28.1	07.0	28.0	07.5	27.9	08.0	27.8	08.4	27.7	08.5	27.6	09.0	29
30	29.1	07.3	29.0	07.8	28.8	08.3	28.7	08.7	28.7	08.8	28.5	09.3	30
31	30.1	07.5	29.9	08.0	29.8	08.5	29.7	09.0	29.6	09.1	29.5	09.6	31
32	31.0	07.8	30.9	08.3	30.8	08.8	30.6	09.3	30.6	09.4	30.4	10.0	32
33	32.0	08.0	31.9	08.5	31.7	09.1	31.6	09.6	31.6	09.6	31.4	10.2	33
34	33.0	08.3	32.8	08.8	32.7	09.4	32.5	09.9	32.5	09.9	32.3	10.5	34
35	33.9	08.5	33.8	09.1	33.6	09.6	33.5	10.2	33.5	10.2	33.3	10.8	35
36	34.9	08.7	34.8	09.3	34.6	09.9	34.4	10.4	34.4	10.5	34.2	11.1	36
37	35.9	09.0	35.7	09.6	35.6	10.2	35.4	10.7	35.4	10.8	35.2	11.4	37
38	36.9	09.2	36.7	09.8	36.5	10.5	36.4	11.0	36.3	11.1	36.1	11.7	38
39	37.8	09.5	37.7	10.1	37.5	10.7	37.3	11.3	37.3	11.4	37.1	12.0	39
40	38.8	09.7	38.6	10.4	38.5	11.0	38.3	11.6	38.3	11.7	38.0	12.4	40
41	39.8	10.0	39.6	10.6	39.4	11.3	39.2	11.9	39.2	12.0	39.0	12.7	41
42	40.7	10.2	40.6	10.9	40.4	11.6	40.2	12.2	40.2	12.3	39.9	13.0	42
43	41.7	10.4	41.5	11.1	41.3	11.8	41.1	12.5	41.1	12.6	40.9	13.3	43
44	42.7	10.7	42.5	11.4	42.3	12.1	42.1	12.8	42.1	12.9	41.8	13.6	44
45	43.6	10.9	43.5	11.6	43.3	12.4	43.1	13.1	43.0	13.1	42.8	13.9	45
46	44.6	11.2	44.4	11.9	44.2	12.7	44.0	13.4	44.0	13.4	43.7	14.2	46
47	45.6	11.4	45.4	12.2	45.2	13.0	45.0	13.6	44.9	13.7	44.7	14.5	47
48	46.6	11.7	46.4	12.4	46.1	13.2	45.9	13.9	45.9	14.0	45.7	14.8	48
49	47.5	11.9	47.3	12.7	47.1	13.5	46.9	14.2	46.9	14.3	46.6	15.1	49
50	48.5	12.1	48.3	12.9	48.1	13.8	47.8	14.5	47.8	14.6	47.6	15.4	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	64 Point		75 Deg.		74 Deg.		64 Point		73 Deg.		72 Deg.		

Of LATITUDE and DEPARTURE,

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Diff.	1½ Point		15 Deg.		16 Deg.		1½ Point		17 Deg.		18 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	49.5	12.4	49.3	13.2	49.0	14.1	48.8	14.8	48.8	14.9	48.5	15.8	51
52	50.4	12.6	50.2	13.5	50.0	14.3	49.7	15.1	49.7	15.2	49.4	16.1	52
53	51.4	12.9	51.2	13.7	50.9	14.6	50.7	15.3	50.7	15.5	50.4	16.4	53
54	52.4	13.1	52.2	14.0	51.9	14.9	51.7	15.7	51.6	15.8	51.3	16.7	54
55	53.3	13.4	53.1	14.2	52.9	15.2	52.6	16.0	52.6	16.1	52.3	17.0	55
56	54.3	13.6	54.1	14.5	53.8	15.4	53.6	16.2	53.5	16.4	53.3	17.3	56
57	55.3	13.9	55.1	14.8	54.8	15.7	54.5	16.5	54.5	16.7	54.2	17.6	57
58	56.3	14.1	56.0	15.0	55.8	16.0	55.5	16.8	55.5	17.0	55.2	17.9	58
59	57.2	14.3	57.0	15.3	56.7	16.3	56.5	17.1	56.4	17.3	56.1	18.2	59
60	58.2	14.6	58.0	15.5	57.7	16.5	57.4	17.4	57.4	17.5	57.1	18.3	60
61	59.2	14.8	58.9	15.8	58.6	16.8	58.4	17.7	58.3	17.8	58.0	18.8	61
62	60.1	15.1	59.9	16.0	59.6	17.1	59.3	18.0	59.3	18.1	59.0	19.2	62
63	61.1	15.3	60.9	16.3	60.6	17.4	60.3	18.3	60.2	18.4	59.9	19.5	63
64	62.1	15.6	61.8	16.6	61.5	17.6	61.2	18.6	61.2	18.7	60.9	19.8	64
65	63.0	15.8	62.8	16.8	62.5	17.9	62.2	18.9	62.2	19.0	61.8	20.1	65
66	64.0	16.0	63.7	17.1	63.4	18.2	63.2	19.2	63.1	19.3	62.8	20.4	66
67	65.0	16.3	64.7	17.3	64.4	18.5	64.1	19.4	64.1	19.6	63.7	20.7	67
68	66.0	16.5	65.7	17.6	65.4	18.7	65.1	19.7	65.0	19.9	64.7	21.0	68
69	66.9	16.8	66.6	17.9	66.3	19.0	66.0	20.0	66.0	20.2	65.6	21.3	69
70	67.9	17.0	67.6	18.1	67.3	19.3	67.0	20.3	66.9	20.5	66.6	21.6	70
71	68.9	17.3	68.6	18.4	68.3	19.6	67.9	20.6	67.9	20.8	67.5	21.9	71
72	69.8	17.5	69.5	18.6	69.2	19.8	68.9	20.9	68.8	21.1	68.5	22.2	72
73	70.8	17.7	70.5	18.9	70.2	20.1	69.9	21.2	69.8	21.3	69.4	22.6	73
74	71.8	18.0	71.5	19.2	71.1	20.4	70.8	21.5	70.8	21.6	70.4	22.9	74
75	72.7	18.2	72.4	19.4	72.1	20.7	71.8	21.8	71.7	21.9	71.3	23.2	75
76	73.7	18.5	73.4	19.7	73.1	20.9	72.7	22.1	72.7	22.2	72.3	23.5	76
77	74.7	18.7	74.4	19.9	74.0	21.2	73.7	22.4	73.6	22.5	73.2	23.8	77
78	75.7	19.0	75.3	20.2	75.0	21.5	74.6	22.6	74.6	22.8	74.2	24.1	78
79	76.6	19.2	76.3	20.4	75.9	21.8	75.6	22.9	75.5	23.1	75.1	24.4	79
80	77.6	19.4	77.3	20.7	76.9	22.0	76.6	23.2	76.5	23.4	76.1	24.7	80
81	78.6	19.7	78.2	21.0	77.9	22.3	77.5	23.5	77.5	23.7	77.0	25.0	81
82	79.5	19.9	79.2	21.2	78.8	22.6	78.5	23.8	78.4	24.0	78.0	25.3	82
83	80.5	20.2	80.2	21.5	79.8	22.9	79.4	24.1	79.4	24.3	78.9	25.6	83
84	81.5	20.4	81.1	21.7	80.7	23.1	80.4	24.4	80.3	24.5	79.9	26.0	84
85	82.4	20.7	82.1	22.0	81.7	23.4	81.3	24.7	81.3	24.8	80.8	26.3	85
86	83.4	20.9	83.1	22.3	82.7	23.7	82.3	25.0	82.2	25.1	81.8	26.6	86
87	84.4	21.1	84.0	22.5	83.6	24.0	83.3	25.3	83.2	25.4	82.7	26.9	87
88	85.4	21.4	85.0	22.8	84.6	24.3	84.2	25.5	84.2	25.7	83.7	27.2	88
89	86.3	21.6	86.0	23.0	85.6	24.5	85.2	25.8	85.1	26.0	84.6	27.5	89
90	87.3	21.9	86.9	23.3	86.5	24.8	86.1	26.1	86.1	26.3	85.6	27.8	90
91	88.3	22.1	87.9	23.5	87.5	25.1	87.1	26.4	87.0	26.6	86.6	28.1	91
92	89.2	22.4	88.9	23.8	88.4	25.4	88.0	26.7	88.0	26.9	87.5	28.4	92
93	90.2	22.6	89.8	24.1	89.4	25.6	89.0	27.0	88.9	27.2	88.4	28.7	93
94	91.2	22.8	90.8	24.3	90.4	25.9	90.0	27.3	89.9	27.5	89.4	29.0	94
95	92.1	23.1	91.8	24.6	91.3	26.2	90.9	27.6	90.8	27.8	90.4	29.4	95
96	93.1	23.3	92.7	24.8	92.3	26.5	91.9	27.9	91.8	28.1	91.3	29.7	96
97	94.1	23.6	93.7	25.1	93.2	26.7	92.8	28.2	92.8	28.4	92.3	30.0	97
98	95.1	23.8	94.7	25.4	94.2	27.0	93.8	28.4	93.7	28.7	93.2	30.3	98
99	96.0	24.1	95.6	25.6	95.2	27.3	94.7	28.7	94.7	28.9	94.2	30.6	99
100	97.0	24.3	96.6	25.9	96.1	27.6	95.7	29.0	95.6	29.2	95.1	30.9	100
Diff.	6½ Point		75 Deg.		74 Deg.		6½ Point		73 Deg.		72 Deg.		Diff.
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	

N

Diff.	19 Deg.		1 1/2 Point		20 Deg.		21 Deg.		22 Deg.		2 Points		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.3	00.9	00.3	00.9	00.3	00.9	00.4	00.9	00.4	00.9	00.4	1
2	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.9	00.7	01.8	00.8	2
3	02.8	01.0	02.8	01.0	02.8	01.0	02.8	01.1	02.8	01.1	02.8	01.1	3
4	03.8	01.3	03.8	01.3	03.8	01.4	03.7	01.4	03.7	01.5	03.7	01.5	4
5	04.7	01.6	04.7	01.7	04.7	01.7	04.7	01.8	04.6	01.9	04.6	01.9	5
6	05.7	02.0	05.6	02.0	05.6	02.1	05.6	02.1	05.6	02.2	05.5	02.3	6
7	06.6	02.3	06.6	02.4	06.6	02.4	06.5	02.5	06.5	02.6	06.5	02.7	7
8	07.6	02.6	07.5	02.7	07.5	02.7	07.5	02.9	07.4	03.0	07.4	03.1	8
9	08.5	02.9	08.4	03.0	08.5	03.1	08.4	03.2	08.3	03.4	08.3	03.4	9
10	09.5	03.3	09.4	03.4	09.4	03.4	09.3	03.6	09.3	03.7	09.2	03.8	10
11	10.4	03.6	10.4	03.7	10.3	03.8	10.3	03.9	10.2	04.1	10.2	04.2	11
12	11.3	03.9	11.3	04.0	11.3	04.1	11.2	04.3	11.1	04.5	11.1	04.6	12
13	12.3	04.2	12.2	04.4	12.2	04.4	12.1	04.7	12.1	04.9	12.0	05.0	13
14	13.2	04.6	13.2	04.7	13.2	04.8	13.1	05.0	13.0	05.2	12.9	05.4	14
15	14.2	04.9	14.1	05.1	14.1	05.1	14.0	05.4	13.9	05.6	13.9	05.7	15
16	15.1	05.2	15.1	05.4	15.0	05.5	14.9	05.7	14.8	06.0	14.8	06.1	16
17	16.1	05.5	16.0	05.7	16.0	05.8	15.9	06.1	15.8	06.4	15.7	06.5	17
18	17.0	05.9	16.9	06.1	16.9	06.2	16.8	06.5	16.7	06.7	16.6	06.9	18
19	18.0	06.2	17.9	06.4	17.9	06.5	17.8	06.8	17.6	07.1	17.5	07.3	19
20	18.9	06.5	18.8	06.7	18.8	06.8	18.7	07.2	18.5	07.5	18.5	07.7	20
21	19.9	06.8	19.8	07.1	19.7	07.2	19.6	07.5	19.5	07.9	19.4	08.0	21
22	20.8	07.2	20.7	07.4	20.7	07.5	20.5	07.9	20.4	08.2	20.3	08.4	22
23	21.7	07.5	21.7	07.7	21.6	07.9	21.5	08.2	21.3	08.6	21.2	08.8	23
24	22.7	07.8	22.6	08.1	22.6	08.2	22.4	08.6	22.3	09.0	22.2	09.2	24
25	23.6	08.1	23.5	08.4	23.5	08.5	23.3	09.0	23.2	09.4	23.1	09.6	25
26	24.6	08.5	24.5	08.8	24.4	08.9	24.3	09.3	24.1	09.7	24.0	09.9	26
27	25.5	08.8	25.4	09.1	25.4	09.2	25.2	09.7	25.0	10.1	24.9	10.2	27
28	26.5	09.1	26.4	09.4	26.3	09.6	26.1	10.0	26.0	10.5	25.9	10.7	28
29	27.4	09.4	27.3	09.8	27.3	09.9	27.1	10.4	26.9	10.9	26.8	11.1	29
30	28.4	09.8	28.2	10.1	28.2	10.3	28.0	10.8	27.8	11.2	27.7	11.5	30
31	29.3	10.1	29.2	10.4	29.1	10.6	28.9	11.1	28.7	11.6	28.6	11.9	31
32	30.3	10.4	30.1	10.8	30.1	10.9	29.9	11.5	29.7	12.0	29.6	12.3	32
33	31.2	10.7	31.1	11.1	31.0	11.3	30.8	11.8	30.6	12.4	30.5	12.6	33
34	32.1	11.1	32.0	11.5	31.9	11.6	31.7	12.2	31.5	12.7	31.4	13.0	34
35	33.1	11.4	33.0	11.8	32.9	12.0	32.7	12.5	32.5	13.1	32.3	13.4	35
36	34.0	11.7	33.9	12.1	33.8	12.3	33.6	12.9	33.4	13.5	33.3	13.8	36
37	35.0	12.0	34.8	12.5	34.8	12.7	34.5	13.3	34.3	13.9	34.2	14.2	37
38	35.9	12.4	35.8	12.8	35.7	13.0	35.5	13.6	35.2	14.2	35.1	14.5	38
39	36.9	12.7	36.7	13.1	36.6	13.3	36.4	14.0	36.2	14.6	36.0	14.9	39
40	37.8	13.0	37.7	13.5	37.6	13.7	37.3	14.3	37.1	15.0	37.0	15.3	40
41	38.8	13.3	38.6	13.8	38.5	14.0	38.3	14.7	38.0	15.4	37.9	15.7	41
42	39.7	13.7	39.5	14.1	39.5	14.4	39.2	15.1	38.9	15.9	38.8	16.1	42
43	40.7	14.0	40.5	14.5	40.4	14.7	40.1	15.4	39.9	16.1	39.7	16.5	43
44	41.6	14.3	41.4	14.8	41.3	15.0	41.1	15.8	40.8	16.5	40.7	16.8	44
45	42.5	14.7	42.4	15.2	42.3	15.4	42.0	16.1	41.7	16.9	41.6	17.2	45
46	43.5	15.0	43.3	15.5	43.2	15.7	42.9	16.5	42.7	17.4	42.5	17.6	46
47	44.4	15.3	44.2	15.8	44.2	16.1	43.9	16.8	43.6	17.6	43.4	18.0	47
48	45.4	15.6	45.2	16.2	45.1	16.4	44.8	17.2	44.5	18.0	44.3	18.4	48
49	46.3	16.0	46.1	16.5	46.0	16.8	45.7	17.6	45.4	18.4	45.3	18.8	49
50	47.3	16.3	47.1	16.8	47.0	17.1	46.7	17.9	46.4	18.7	46.2	19.1	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	60 Deg.	6 Point	70 Deg.	69 Deg.	68 Deg.	68 Deg.	68 Deg.	6 Points					

Of LATITUDE and DEPARTURE,

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Dist.	19 Deg.		1 1/2 Point		20 Deg.		21 Deg.		22 Deg.		2 Point		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	48.2	16.6	48.0	17.2	47.9	17.4	47.6	18.3	47.3	19.1	47.1	19.5	51
52	49.2	16.9	49.0	17.5	48.9	17.8	48.5	18.6	48.2	19.5	48.0	19.9	52
53	50.1	17.3	49.9	17.9	49.8	18.1	49.5	19.0	49.1	19.9	49.0	20.3	53
54	51.0	17.6	50.8	18.2	50.7	18.5	50.4	19.4	50.1	20.2	49.9	20.7	54
55	52.0	17.9	51.8	18.5	51.7	18.8	51.3	19.7	51.0	20.6	50.8	21.0	55
56	52.9	18.2	52.7	18.9	52.6	19.2	52.3	20.1	51.9	21.0	51.7	21.4	56
57	53.9	18.6	53.7	19.2	53.6	19.5	53.2	20.4	52.8	21.4	52.7	21.8	57
58	54.8	18.9	54.6	19.5	54.5	19.8	54.1	20.8	53.8	21.7	53.6	22.2	58
59	55.8	19.2	55.5	19.9	55.4	20.2	55.1	21.1	54.7	22.1	54.5	22.6	59
60	56.7	19.5	56.5	20.2	56.4	20.5	56.0	21.5	55.6	22.6	55.4	23.0	60
61	57.7	19.9	57.4	20.6	57.3	20.9	56.9	21.9	56.5	22.8	56.4	23.3	61
62	58.6	20.2	58.4	20.9	58.3	21.2	57.9	22.2	57.5	23.2	57.3	23.7	62
63	59.6	20.5	59.3	21.2	59.2	21.5	58.8	22.6	58.4	23.6	58.2	24.1	63
64	60.5	20.8	60.3	21.6	60.1	21.9	59.7	22.9	59.3	24.0	59.1	24.5	64
65	61.5	21.2	61.2	21.9	61.1	22.2	60.7	23.3	60.3	24.3	60.1	24.9	65
66	62.4	21.5	62.1	22.2	62.0	22.6	61.6	23.7	61.2	24.7	61.0	25.3	66
67	63.3	21.8	63.1	22.6	63.0	22.9	62.6	24.0	62.1	25.1	61.9	25.6	67
68	64.3	22.1	64.0	22.9	63.9	23.3	63.5	24.4	63.0	25.5	62.8	26.0	68
69	65.2	22.5	65.0	23.2	64.8	23.6	64.4	24.7	64.0	25.8	63.7	26.4	69
70	66.2	22.8	65.9	23.6	65.8	23.9	65.4	25.1	64.9	26.2	64.7	26.8	70
71	67.1	23.1	66.8	23.9	66.7	24.3	66.3	25.4	65.8	26.6	65.6	27.2	71
72	68.1	23.4	67.8	24.3	67.7	24.6	67.2	25.8	66.8	27.0	66.6	27.6	72
73	69.0	23.8	68.7	24.6	68.6	25.0	68.2	26.2	67.7	27.3	67.4	27.9	73
74	70.0	24.1	69.7	24.9	69.5	25.3	69.1	26.5	68.6	27.7	68.4	28.3	74
75	70.9	24.4	70.6	25.3	70.5	25.6	70.0	26.9	69.5	28.1	69.3	28.7	75
76	71.9	24.7	71.6	25.6	71.4	26.0	71.0	27.2	70.5	28.5	70.2	29.1	76
77	72.8	25.1	72.5	25.9	72.4	26.3	71.9	27.6	71.4	28.8	71.1	29.5	77
78	73.7	25.4	73.4	26.3	73.3	26.7	72.8	28.0	72.3	29.2	72.1	29.8	78
79	74.7	25.7	74.4	26.6	74.2	27.0	73.8	28.3	73.2	29.6	73.0	30.2	79
80	75.6	26.0	75.3	27.0	75.2	27.4	74.7	28.7	74.2	30.0	73.9	30.6	80
81	76.6	26.4	76.3	27.3	76.1	27.7	75.6	29.0	75.1	30.3	74.8	31.0	81
82	77.5	26.7	77.2	27.6	77.1	28.0	76.6	29.4	76.0	30.7	75.8	31.4	82
83	78.5	27.0	78.1	28.0	78.0	28.4	77.5	29.7	77.0	31.1	76.7	31.8	83
84	79.4	27.3	79.1	28.3	78.9	28.7	78.4	30.1	77.9	31.5	77.6	32.1	84
85	80.4	27.7	80.0	28.6	79.9	29.1	79.4	30.5	78.8	31.8	78.5	32.5	85
86	81.3	28.0	81.0	29.0	80.8	29.4	80.3	30.8	79.7	32.2	79.5	32.9	86
87	82.3	28.3	81.9	29.3	81.8	29.8	81.2	31.2	80.7	32.6	80.4	33.3	87
88	83.2	28.7	82.9	29.6	82.7	30.1	82.2	31.5	81.6	33.0	81.3	33.7	88
89	84.1	29.0	83.8	30.0	83.6	30.4	83.1	31.9	82.5	33.3	82.2	34.1	89
90	85.1	29.3	84.7	30.3	84.6	30.8	84.0	32.3	83.4	33.7	83.2	34.4	90
91	86.0	29.6	85.7	30.7	85.5	31.1	85.0	32.6	84.4	34.1	84.1	34.8	91
92	87.0	30.0	86.6	31.0	86.5	31.5	85.9	33.0	85.3	34.5	85.0	35.2	92
93	87.9	30.3	87.6	31.3	87.4	31.8	86.8	33.3	86.2	34.8	85.9	35.6	93
94	88.9	30.6	88.5	31.7	88.3	32.1	87.8	33.7	87.2	35.2	86.8	36.0	94
95	89.8	30.9	89.4	32.0	89.3	32.5	88.7	34.0	88.1	35.6	87.8	36.4	95
96	90.8	31.3	90.4	32.3	90.2	32.8	89.6	34.4	89.0	36.0	88.7	36.7	96
97	91.7	31.6	91.3	32.7	91.1	33.2	90.6	34.8	89.9	36.3	89.5	37.1	97
98	92.7	31.9	92.3	33.0	92.1	33.5	91.5	35.1	90.9	36.7	90.5	37.5	98
99	93.6	32.2	93.2	33.4	93.0	33.9	92.4	35.5	91.8	37.1	91.5	37.9	99
100	94.5	32.6	94.2	33.7	94.0	34.2	93.4	35.8	92.7	37.5	92.4	38.3	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	21 Deg.	6 1/2 Point	20 Deg.	6 Deg.	19 Deg.	5 1/2 Point	18 Deg.	5 Point	17 Deg.	4 1/2 Point	16 Deg.	4 Point	

A Table of DIFFERENCE

Diff. 1	23 Deg.		24 Deg.		25 Deg.		2 1/2 Point		26 Deg.		27 Deg.		Diff. 1
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.4	00.9	00.5	1
2	01.8	00.8	01.8	00.8	01.8	00.8	01.8	00.9	01.8	00.9	01.8	00.9	2
3	02.8	01.2	02.7	01.2	02.7	01.3	02.7	01.3	02.7	01.3	02.7	01.4	3
4	03.7	01.6	03.7	01.6	03.6	01.7	03.6	01.7	03.6	01.8	03.6	01.8	4
5	04.6	02.0	04.6	02.0	04.5	02.1	04.5	02.1	04.5	02.2	04.5	02.3	5
6	05.5	02.3	05.5	02.4	05.4	02.5	05.4	02.6	05.4	02.6	05.3	02.7	6
7	06.4	02.7	06.4	02.8	06.3	03.0	06.3	03.0	06.3	03.1	06.2	03.2	7
8	07.4	03.1	07.3	03.3	07.2	03.4	07.2	03.4	07.2	03.5	07.1	03.6	8
9	08.3	03.5	08.2	03.7	08.2	03.8	08.1	03.8	08.1	03.9	08.0	04.1	9
10	09.2	03.9	09.1	04.1	09.1	04.2	09.0	04.3	09.0	04.4	08.9	04.5	10
11	10.1	04.3	10.0	04.5	10.0	04.6	09.9	04.7	09.9	04.8	09.8	05.0	11
12	11.0	04.7	11.0	04.9	10.9	05.1	10.8	05.1	10.8	05.3	10.7	05.4	12
13	12.0	05.1	11.9	05.3	11.8	05.5	11.8	05.6	11.7	05.7	11.6	05.9	13
14	12.9	05.5	12.8	05.7	12.7	05.9	12.7	06.0	12.6	06.1	12.5	06.4	14
15	13.8	05.9	13.7	06.1	13.6	06.3	13.6	06.4	13.5	06.6	13.4	06.8	15
16	14.7	06.2	14.6	06.5	14.5	06.8	14.5	06.8	14.4	06.9	14.3	07.3	16
17	15.6	06.6	15.5	06.9	15.4	07.2	15.4	07.3	15.3	07.5	15.1	07.7	17
18	16.6	07.0	16.4	07.3	16.3	07.6	16.3	07.7	16.2	07.9	16.0	08.2	18
19	17.5	07.4	17.4	07.7	17.2	08.0	17.2	08.1	17.1	08.3	16.9	08.6	19
20	18.4	07.8	18.3	08.1	18.1	08.5	18.1	08.6	18.0	08.8	17.8	09.1	20
21	19.3	08.2	19.2	08.5	19.0	08.9	19.0	09.0	18.9	09.2	18.7	09.5	21
22	20.3	08.6	20.1	08.9	19.9	09.3	19.9	09.4	19.8	09.6	19.6	10.0	22
23	21.2	09.0	21.0	09.4	20.8	09.7	20.8	09.8	20.7	10.1	20.5	10.4	23
24	22.1	09.4	21.9	09.8	21.8	10.1	21.7	10.3	21.6	10.5	21.4	10.9	24
25	23.0	09.8	22.8	10.2	22.7	10.6	22.6	10.7	22.5	11.0	22.3	11.3	25
26	23.9	10.2	23.8	10.6	23.6	11.0	23.5	11.1	23.4	11.4	23.2	11.8	26
27	24.9	10.5	24.7	11.0	24.5	11.4	24.4	11.5	24.3	11.8	24.1	12.3	27
28	25.8	10.9	25.6	11.4	25.4	11.8	25.3	12.0	25.2	12.3	24.9	12.7	28
29	26.7	11.3	26.5	11.8	26.3	12.3	26.2	12.4	26.1	12.7	25.8	13.2	29
30	27.6	11.7	27.4	12.2	27.2	12.7	27.1	12.8	27.0	13.2	26.7	13.6	30
31	28.5	12.1	28.3	12.6	28.1	13.1	28.0	13.3	27.9	13.6	27.6	14.1	31
32	29.5	12.5	29.2	13.0	29.0	13.5	28.9	13.7	28.8	14.0	28.5	14.5	32
33	30.4	12.9	30.1	13.4	29.9	13.9	29.8	14.1	29.7	14.5	29.4	15.0	33
34	31.3	13.3	31.1	13.8	30.8	14.4	30.7	14.5	30.6	14.9	30.3	15.4	34
35	32.2	13.7	32.0	14.2	31.7	14.8	31.6	15.0	31.5	15.3	31.2	15.9	35
36	33.1	14.1	32.9	14.6	32.6	15.2	32.5	15.4	32.4	15.8	32.1	16.3	36
37	34.1	14.5	33.8	15.0	33.5	15.6	33.4	15.8	33.3	16.2	33.0	16.8	37
38	35.0	14.8	34.7	15.5	34.4	16.1	34.4	16.2	34.2	16.7	33.9	17.3	38
39	35.9	15.2	35.6	15.9	35.3	16.5	35.3	16.7	35.1	17.1	34.7	17.7	39
40	36.8	15.6	36.5	16.3	36.3	16.9	36.2	17.1	36.0	17.5	35.6	18.2	40
41	37.7	16.0	37.5	16.7	37.2	17.3	37.1	17.5	36.8	18.0	36.5	18.6	41
42	38.7	16.4	38.4	17.1	38.1	17.7	38.0	18.0	37.7	18.4	37.4	19.1	42
43	39.6	16.8	39.3	17.5	39.0	18.2	38.9	18.4	38.6	18.9	38.3	19.5	43
44	40.5	17.2	40.2	17.9	39.9	18.6	39.8	18.8	39.5	19.3	39.2	20.0	44
45	41.4	17.6	41.1	18.3	40.8	19.0	40.7	19.2	40.4	19.7	40.1	20.4	45
46	42.3	18.0	42.0	18.7	41.7	19.4	41.6	19.7	41.3	20.2	41.0	20.9	46
47	43.3	18.4	42.9	19.1	42.6	19.9	42.5	20.1	42.2	20.6	41.9	21.3	47
48	44.2	18.8	43.8	19.5	43.5	20.3	43.4	20.5	43.1	21.0	42.8	21.8	48
49	45.1	19.2	44.8	19.9	44.4	20.7	44.3	20.9	44.0	21.5	43.7	22.2	49
50	46.0	19.6	45.7	20.3	45.3	21.1	45.2	21.4	44.9	21.9	44.5	22.7	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Diff.
	63 Deg.	66 Deg.	66 Deg.	65 Deg.	65 Deg.	5 1/2 Point	64 Deg.	63 Deg.	63 Deg.	63 Deg.	63 Deg.	63 Deg.	

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Dist.	23 Deg.		24 Deg.		25 Deg.		24 Point		26 Deg.		27 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	46.9	19.9	46.6	20.7	46.2	21.6	46.1	21.8	45.8	22.4	45.4	23.2	51
52	47.9	20.3	47.5	21.1	47.1	22.0	47.0	22.2	46.7	22.8	46.3	23.6	52
53	48.8	20.7	48.4	21.7	48.0	22.4	47.9	22.7	47.6	23.2	47.2	24.1	53
54	49.7	21.1	49.3	22.0	48.9	22.8	48.8	23.1	48.5	23.7	48.1	24.5	54
55	50.6	21.5	50.2	22.4	49.8	23.2	49.7	23.5	49.4	24.1	49.0	25.0	55
56	51.5	21.9	51.2	22.8	50.8	23.7	50.6	23.9	50.3	24.5	49.9	25.4	56
57	52.5	22.3	52.1	23.2	51.7	24.1	51.5	24.4	51.2	25.0	50.8	25.9	57
58	53.4	22.7	53.0	23.6	52.6	24.5	52.4	24.8	52.1	25.4	51.7	26.3	58
59	54.3	23.1	53.9	24.0	53.5	24.9	53.3	25.2	53.0	25.9	52.6	26.8	59
60	55.2	23.4	54.8	24.4	54.4	25.4	54.2	25.7	53.9	26.3	53.5	27.2	60
61	56.1	23.8	55.7	24.8	55.3	25.8	55.1	26.1	54.8	26.7	54.4	27.7	61
62	57.1	24.2	56.6	25.2	56.2	26.2	56.0	26.5	55.7	27.2	55.2	28.1	62
63	58.0	24.6	57.5	25.6	57.1	26.6	57.0	26.9	56.6	27.6	56.1	28.6	63
64	58.9	25.0	58.5	26.0	58.0	27.0	57.9	27.4	57.5	28.1	57.0	29.1	64
65	59.8	25.4	59.4	26.4	58.9	27.5	58.8	27.8	58.4	28.5	57.9	29.5	65
66	60.8	25.8	60.3	26.8	59.0	27.9	59.7	28.2	59.3	28.9	58.8	30.0	66
67	61.7	26.2	61.2	27.2	60.7	28.3	60.6	28.6	60.2	29.4	59.7	30.4	67
68	62.6	26.6	62.1	27.7	61.6	28.7	61.5	29.1	61.1	29.8	60.5	30.9	68
69	63.5	27.0	63.0	28.1	62.5	29.2	62.4	29.5	62.0	30.2	61.5	31.3	69
70	64.4	27.3	63.9	28.5	63.4	29.6	63.3	29.9	62.9	30.7	62.4	31.8	70
71	65.4	27.7	64.9	28.9	64.3	30.0	64.2	30.4	63.8	31.1	63.3	32.2	71
72	66.3	28.1	65.8	29.3	65.3	30.4	65.1	30.8	64.7	31.6	64.2	32.7	72
73	67.2	28.5	66.7	29.7	66.2	30.8	66.0	31.2	65.6	32.0	65.0	33.1	73
74	68.1	28.9	67.6	30.1	67.1	31.3	66.9	31.6	66.5	32.4	65.9	33.6	74
75	69.0	29.3	68.5	30.5	68.0	31.7	67.8	32.1	67.4	32.9	66.8	34.1	75
76	70.0	29.7	69.4	30.9	68.9	32.1	68.7	32.5	68.3	33.3	67.7	34.5	76
77	70.9	30.1	70.3	31.3	69.8	32.5	69.6	32.9	69.2	33.8	68.6	35.0	77
78	71.8	30.5	71.3	31.7	70.7	33.0	70.5	33.4	70.1	34.2	69.5	35.4	78
79	72.7	30.9	72.2	32.1	71.6	33.4	71.4	33.8	71.0	34.6	70.4	35.9	79
80	73.6	31.3	73.1	32.5	72.5	33.8	72.3	34.2	71.9	35.1	71.1	36.3	80
81	74.6	31.6	74.0	32.9	73.4	34.2	73.2	34.6	72.8	35.5	72.2	36.8	81
82	75.5	32.0	74.9	33.3	74.3	34.7	74.1	35.1	73.7	35.9	73.1	37.2	82
83	76.4	32.4	75.8	33.7	75.2	35.1	75.0	35.5	74.6	36.4	74.0	37.7	83
84	77.3	32.8	76.7	34.1	76.1	35.5	75.9	35.9	75.5	36.8	74.8	38.1	84
85	78.2	33.2	77.6	34.6	77.0	35.9	76.8	36.3	76.4	37.3	75.7	38.6	85
86	79.2	33.6	78.6	35.0	77.9	36.3	77.7	36.8	77.3	37.7	76.6	39.0	86
87	80.1	34.0	79.5	35.4	78.8	36.8	78.6	37.2	78.2	38.1	77.5	39.5	87
88	81.0	34.4	80.4	35.8	79.8	37.2	79.6	37.6	79.1	38.6	78.4	40.0	88
89	81.9	34.8	81.3	36.2	80.7	37.6	80.5	38.1	80.0	39.0	79.3	40.4	89
90	82.8	35.2	82.2	36.6	81.6	38.0	81.4	38.5	80.9	39.5	80.2	40.9	90
91	83.8	35.6	83.1	37.0	82.5	38.5	82.3	38.9	81.8	39.9	81.1	41.3	91
92	84.7	35.9	84.0	37.4	83.4	38.9	83.2	39.3	82.7	40.3	82.0	41.8	92
93	85.6	36.3	85.0	37.8	84.3	39.3	84.1	39.8	83.6	40.8	82.9	42.2	93
94	86.5	36.7	85.9	38.2	85.2	39.7	85.0	40.2	84.5	41.2	83.8	42.7	94
95	87.4	37.1	86.8	38.6	86.1	40.1	85.9	40.6	85.4	41.6	84.6	43.1	95
96	88.3	37.5	87.7	39.0	87.0	40.6	86.8	41.0	86.3	42.1	85.5	43.6	96
97	89.3	37.9	88.6	39.4	87.9	41.0	87.7	41.5	87.2	42.5	86.4	44.0	97
98	90.2	38.4	89.5	39.9	88.8	41.4	88.6	41.9	88.1	43.0	87.3	44.5	98
99	91.1	38.7	90.4	40.3	89.7	41.8	89.5	42.3	89.0	43.4	88.2	44.9	99
100	92.0	39.1	91.4	40.7	90.6	42.3	90.4	42.8	89.9	43.8	89.1	45.4	100
Dist.	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dep.	Lat	Dist.
Dist.	67 Deg.		66 Deg.		65 Deg.		54 Point		64 Deg.		63 Deg.		Dist.

Diff. 1	28 Deg.		2½ Point		29 Deg.		30 Deg.		2½ Point		31 Deg.		Diff. 1
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	00.9	00.5	1
2	01.8	00.9	01.8	00.9	01.7	01.0	01.7	01.0	01.7	01.0	01.7	01.0	2
3	02.6	01.4	02.6	01.4	02.6	01.5	02.6	01.5	02.6	01.5	02.6	01.5	3
4	03.5	01.9	03.5	01.9	03.5	01.9	03.5	02.0	03.4	02.1	03.4	02.1	4
5	04.4	02.5	04.4	02.4	04.4	02.4	04.3	02.5	04.3	02.6	04.3	02.6	5
6	05.3	02.8	05.3	02.8	05.2	02.9	05.2	03.0	05.1	03.1	05.1	03.1	6
7	06.2	03.3	06.2	03.3	06.1	03.4	06.1	03.5	06.0	03.6	06.0	03.6	7
8	07.1	03.8	07.1	03.8	07.0	03.9	06.9	04.0	06.9	04.1	06.9	04.1	8
9	07.9	04.2	07.9	04.2	07.9	04.4	07.8	04.5	07.7	04.6	07.7	04.6	9
10	08.8	04.7	08.8	04.7	08.7	04.8	08.7	05.0	08.6	05.1	08.6	05.1	10
11	09.7	05.2	09.7	05.2	09.6	05.3	09.5	05.5	09.4	05.7	09.4	05.7	11
12	10.6	05.6	10.6	05.7	10.5	05.8	10.4	06.0	10.3	06.2	10.3	06.2	12
13	11.5	06.1	11.5	06.1	11.4	06.3	11.3	06.5	11.1	06.7	11.1	06.7	13
14	12.4	06.6	12.3	06.6	12.2	06.8	12.1	07.0	12.0	07.2	12.0	07.2	14
15	13.2	07.0	13.2	07.1	13.1	07.3	13.0	07.5	12.9	07.7	12.9	07.7	15
16	14.1	07.5	14.1	07.5	14.0	07.8	13.9	08.0	13.7	08.2	13.7	08.2	16
17	15.0	08.0	15.0	08.0	14.9	08.2	14.7	08.5	14.6	08.7	14.6	08.8	17
18	15.9	08.5	15.9	08.5	15.7	08.7	15.6	09.0	15.4	09.3	15.4	09.3	18
19	16.8	08.9	16.8	09.0	16.6	09.2	16.5	09.5	16.3	09.8	16.3	09.8	19
20	17.7	09.4	17.6	09.4	17.5	09.7	17.3	10.0	17.2	10.3	17.1	10.3	20
21	18.5	09.9	18.5	09.9	18.4	10.2	18.2	10.5	18.0	10.8	18.0	10.8	21
22	19.4	10.3	19.4	10.4	19.2	10.7	19.1	11.0	18.9	11.3	18.9	11.3	22
23	20.3	10.8	20.3	10.8	20.1	11.1	19.9	11.5	19.7	11.8	19.7	11.8	23
24	21.2	11.3	21.2	11.3	21.0	11.6	20.8	12.0	20.6	12.3	20.6	12.3	24
25	22.1	11.7	22.0	11.8	21.9	12.1	21.6	12.5	21.4	12.9	21.4	12.9	25
26	23.0	12.2	22.9	12.3	22.7	12.6	22.5	13.0	22.3	13.4	22.3	13.4	26
27	23.8	12.7	23.8	12.7	23.6	13.1	23.4	13.5	23.2	13.9	23.1	13.9	27
28	24.7	13.1	24.7	13.2	24.5	13.6	24.2	14.0	24.0	14.4	24.0	14.4	28
29	25.6	13.6	25.6	13.7	25.4	14.1	25.1	14.5	24.9	14.9	24.9	14.9	29
30	26.5	14.1	26.5	14.1	26.2	14.5	26.0	15.0	25.7	15.4	25.7	15.4	30
31	27.4	14.6	27.3	14.6	27.1	15.0	26.8	15.5	26.6	15.9	26.6	16.0	31
32	28.3	15.0	28.2	15.1	28.0	15.5	27.7	16.0	27.4	16.4	27.4	16.5	32
33	29.1	15.5	29.1	15.6	28.9	16.0	28.6	16.5	28.3	17.0	28.3	17.0	33
34	30.0	16.0	30.0	16.0	29.7	16.5	29.4	17.0	29.2	17.6	29.1	17.5	34
35	30.9	16.4	30.9	16.5	30.0	17.0	30.3	17.5	30.0	18.0	30.0	18.0	35
36	31.8	16.9	31.7	17.0	31.5	17.5	31.2	18.0	30.9	18.5	30.9	18.5	36
37	32.7	17.4	32.6	17.4	32.4	17.9	32.0	18.5	31.7	19.0	31.7	19.1	37
38	33.5	17.8	33.5	17.9	33.2	18.4	32.9	19.0	32.6	19.5	32.6	19.6	38
39	34.4	18.3	34.4	18.4	34.1	18.9	33.8	19.5	33.4	20.0	33.4	20.1	39
40	35.3	18.8	35.3	18.9	35.0	19.4	34.0	20.0	34.3	20.6	34.3	20.6	40
41	36.2	19.2	36.2	19.3	35.9	19.9	35.5	20.5	35.2	21.1	35.1	21.1	41
42	37.1	19.7	37.0	19.8	36.7	20.4	36.4	21.0	36.0	21.6	36.0	21.6	42
43	38.0	20.2	37.9	20.3	37.6	20.8	37.2	21.5	36.9	22.1	36.9	22.1	43
44	38.8	20.7	38.8	20.7	38.5	21.3	38.1	22.0	37.7	22.6	37.7	22.7	44
45	39.7	21.1	39.7	21.2	39.4	21.8	39.0	22.5	38.6	23.1	38.6	23.2	45
46	40.6	21.6	40.6	21.7	40.2	22.3	39.8	23.0	39.5	23.6	39.4	23.7	46
47	41.5	22.1	41.4	22.2	41.1	22.8	40.7	23.5	40.3	24.2	40.3	24.2	47
48	42.4	22.5	42.3	22.6	42.0	23.3	41.6	24.0	41.2	24.7	41.1	24.7	48
49	43.3	23.0	43.2	23.1	42.9	23.8	42.4	24.5	42.0	25.2	42.0	25.2	49
50	44.1	23.5	44.1	24.0	43.7	24.2	43.3	25.0	42.9	25.7	42.9	25.7	50
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
	28 Deg.		2½ Point		29 Deg.		30 Deg.		2½ Point		31 Deg.		

Dist.	28 Deg.		2½ Point		29 Deg.		30 Deg.		2½ Point		31 Deg.		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	45.0	23.9	45.0	24.0	44.6	24.7	44.2	25.5	43.7	26.2	43.7	26.3	51
52	45.9	24.4	45.9	24.5	45.5	25.2	45.0	26.0	44.0	26.7	44.6	26.8	52
53	46.8	24.9	46.7	25.0	46.4	25.7	45.9	26.5	45.5	27.2	45.4	27.3	53
54	47.7	25.4	47.6	25.5	47.2	26.2	46.8	27.0	46.3	27.8	46.3	27.8	54
55	48.6	25.8	48.5	25.9	48.1	26.7	47.6	27.5	47.2	28.3	47.1	28.3	55
56	49.4	26.3	49.4	26.4	49.0	27.1	48.5	28.0	48.0	28.8	48.0	28.8	56
57	50.3	26.8	50.3	26.9	49.9	27.6	49.4	28.5	48.9	29.3	48.9	29.4	57
58	51.2	27.2	51.2	27.3	50.7	28.1	50.2	29.0	49.7	29.8	49.7	29.9	58
59	52.1	27.7	52.0	27.8	51.6	28.6	51.1	29.5	50.6	30.3	50.6	30.4	59
60	53.0	28.2	52.9	28.3	52.5	29.1	52.0	30.0	51.5	30.8	51.4	30.9	60
61	53.9	28.6	53.8	28.8	53.3	29.6	52.8	30.5	52.3	31.4	52.3	31.4	61
62	54.7	29.1	54.7	29.2	54.2	30.1	53.7	31.0	53.2	31.9	53.1	31.9	62
63	55.6	29.6	55.6	29.7	55.1	30.5	54.6	31.5	54.0	32.4	54.0	32.4	63
64	56.5	30.0	56.4	30.2	56.0	31.0	55.4	32.0	54.9	32.9	54.9	33.0	64
65	57.4	30.5	57.3	30.6	56.8	31.5	56.3	32.5	55.7	33.4	55.7	33.5	65
66	58.3	31.0	58.2	31.1	57.7	32.0	57.2	33.0	56.6	33.9	56.6	34.0	66
67	59.2	31.5	59.1	31.6	58.6	32.5	58.0	33.5	57.5	34.4	57.4	34.5	67
68	60.0	31.9	60.0	32.1	59.5	33.0	58.9	34.0	58.3	35.0	58.3	35.0	68
69	60.9	32.4	60.9	32.5	60.3	33.5	59.8	34.5	59.2	35.5	59.1	35.5	69
70	61.8	32.9	61.7	33.0	61.2	33.9	60.6	35.0	60.0	36.0	60.0	36.0	70
71	62.7	33.3	62.6	33.5	62.1	34.4	61.5	35.5	60.9	36.5	60.9	36.6	71
72	63.6	33.8	63.5	33.9	63.0	34.9	62.4	36.0	61.8	37.0	61.7	37.1	72
73	64.5	34.3	64.4	34.4	63.8	35.4	63.2	36.5	62.6	37.5	62.6	37.6	73
74	65.3	34.7	65.3	34.9	64.7	35.9	64.1	37.0	63.5	38.0	63.4	38.1	74
75	66.2	35.2	66.1	35.4	65.6	36.4	64.9	37.5	64.3	38.6	64.3	38.6	75
76	67.1	35.7	67.0	35.8	66.5	36.8	65.8	38.0	65.2	39.1	65.1	39.1	76
77	68.0	36.2	67.9	36.3	67.3	37.3	66.7	38.5	66.0	39.6	66.0	39.7	77
78	68.9	36.6	68.8	36.8	68.2	37.8	67.5	39.0	66.9	40.1	66.9	40.2	78
79	69.7	37.1	69.7	37.2	69.1	38.3	68.4	39.5	67.8	40.6	67.7	40.7	79
80	70.6	37.6	70.6	37.7	70.0	38.8	69.3	40.0	68.6	41.1	68.6	41.2	80
81	71.5	38.0	71.4	38.2	70.8	39.3	70.1	40.5	69.5	41.6	69.4	41.7	81
82	72.4	38.5	72.3	38.7	71.7	39.8	71.0	41.0	70.3	42.2	70.3	42.2	82
83	73.3	39.0	73.2	39.1	72.6	40.2	71.9	41.5	71.2	42.7	71.1	42.7	83
84	74.2	39.4	74.1	39.6	73.5	40.7	72.7	42.0	72.0	43.2	72.0	43.3	84
85	75.0	39.9	75.0	40.1	74.3	41.2	73.6	42.5	72.9	43.7	72.9	43.8	85
86	75.9	40.4	75.8	40.5	75.2	41.7	74.5	43.0	73.8	44.2	73.7	44.3	86
87	76.8	40.8	76.7	41.0	76.1	42.2	75.3	43.5	74.6	44.7	74.6	44.8	87
88	77.7	41.3	77.6	41.5	77.0	42.7	76.2	44.0	75.5	45.2	75.4	45.3	88
89	78.6	41.8	78.5	42.0	77.8	43.1	77.1	44.5	76.3	45.8	76.3	45.8	89
90	79.5	42.3	79.4	42.4	78.7	43.6	77.9	45.0	77.2	46.3	77.1	46.3	90
91	80.3	42.7	80.3	42.9	79.6	44.1	78.8	45.5	78.1	46.8	78.0	46.9	91
92	81.2	43.2	81.1	43.4	80.5	44.6	79.7	46.0	78.9	47.3	78.9	47.4	92
93	82.1	43.7	82.0	43.8	81.3	45.1	80.5	46.5	79.8	47.8	79.7	47.9	93
94	83.0	44.1	82.9	44.3	82.2	45.6	81.4	47.0	80.6	48.3	80.6	48.4	94
95	83.9	44.6	83.8	44.8	83.1	46.1	82.3	47.5	81.5	48.8	81.4	48.9	95
96	84.8	45.1	84.7	45.3	84.0	46.5	83.1	48.0	82.3	49.4	82.3	49.4	96
97	85.6	45.5	85.5	45.7	84.8	47.0	84.0	48.5	83.2	49.9	83.1	50.0	97
98	86.5	46.0	86.4	46.2	85.7	47.5	84.9	49.0	84.1	50.4	84.0	50.5	98
99	87.4	46.5	87.3	46.7	86.6	48.0	85.7	49.5	84.9	50.9	84.9	51.0	99
100	88.3	46.9	88.2	47.1	87.5	48.5	86.6	50.0	85.8	51.4	85.7	51.5	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	62 Deg.		5 Point		61 Deg.		60 Deg.		5½ Point		50		

Diff.	32 Deg.		33 Deg.		3 Points		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.5	00.8	00.5	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.7	01.1	01.7	01.1	01.7	01.1	01.6	01.1	01.6	01.1	01.6	01.1	2
3	02.5	01.6	02.5	01.6	02.5	01.7	02.5	01.7	02.5	01.7	02.5	01.7	3
4	03.4	02.1	03.4	02.2	03.3	02.2	03.3	02.2	03.3	02.3	03.2	02.4	4
5	04.2	02.6	04.2	02.7	04.2	02.8	04.1	02.8	04.1	02.9	04.0	02.9	5
6	05.1	03.2	05.0	03.3	05.0	03.3	05.0	03.4	04.9	03.4	04.8	03.5	6
7	05.9	03.7	05.9	03.8	05.8	03.9	05.8	03.9	05.7	04.0	05.7	04.1	7
8	06.8	04.2	06.7	04.4	06.6	04.4	06.6	04.5	06.6	04.6	06.5	04.7	8
9	07.6	04.8	07.5	04.9	07.5	05.0	07.5	05.0	07.4	05.2	07.3	05.3	9
10	08.5	05.3	08.4	05.4	08.3	05.5	08.3	05.6	08.2	05.7	08.1	05.9	10
11	09.3	05.8	09.2	06.0	09.1	06.1	09.1	06.2	09.0	06.3	08.9	06.5	11
12	10.2	06.4	10.1	06.5	10.0	06.7	09.9	06.7	09.8	06.9	09.7	07.0	12
13	11.0	06.9	10.9	07.1	10.8	07.2	10.8	07.3	10.6	07.5	10.5	07.6	13
14	11.9	07.4	11.7	07.6	11.6	07.8	11.6	07.8	11.5	08.0	11.3	08.2	14
15	12.7	07.9	12.6	08.2	12.5	08.3	12.4	08.3	12.3	08.6	12.1	08.8	15
16	13.6	08.5	13.4	08.7	13.3	08.9	13.3	08.9	13.1	09.2	12.9	09.4	16
17	14.4	09.0	14.3	09.3	14.1	09.4	14.1	09.5	13.9	09.8	13.8	10.0	17
18	15.3	09.5	15.1	09.8	15.0	10.0	14.9	10.1	14.7	10.3	14.6	10.6	18
19	16.1	10.1	15.9	10.3	15.8	10.6	15.8	10.6	15.6	10.9	15.4	11.2	19
20	17.0	10.6	16.8	10.9	16.6	11.1	16.6	11.2	16.4	11.5	16.2	11.8	20
21	17.8	11.1	17.6	11.4	17.5	11.7	17.4	11.7	17.2	12.0	17.0	12.3	21
22	18.7	11.7	18.5	12.0	18.3	12.2	18.2	12.3	18.0	12.6	17.8	12.9	22
23	19.5	12.2	19.3	12.5	19.1	12.8	19.1	12.9	18.8	13.2	18.6	13.5	23
24	20.4	12.7	20.1	13.1	20.0	13.3	19.9	13.4	19.7	13.8	19.4	14.1	24
25	21.2	13.2	21.0	13.6	20.8	13.9	20.7	14.0	20.5	14.3	20.2	14.7	25
26	22.0	13.8	21.8	14.2	21.6	14.4	21.6	14.5	21.3	14.9	21.0	15.3	26
27	22.9	14.3	22.6	14.7	22.4	15.0	22.4	15.1	22.1	15.5	21.8	15.9	27
28	23.7	14.8	23.5	15.2	23.3	15.6	23.2	15.7	22.9	16.1	22.7	16.5	28
29	24.6	15.4	24.3	15.8	24.1	16.1	24.0	16.2	23.8	16.6	23.5	17.0	29
30	25.4	15.9	25.2	16.3	24.9	16.7	24.9	16.8	24.6	17.2	24.3	17.6	30
31	26.3	16.4	26.0	16.9	25.8	17.2	25.7	17.3	25.4	17.8	25.1	18.2	31
32	27.1	17.0	26.8	17.4	26.6	17.8	26.5	17.9	26.2	18.4	25.9	18.8	32
33	28.0	17.5	27.7	18.0	27.4	18.3	27.4	18.5	27.0	18.9	26.7	19.4	33
34	28.8	18.0	28.5	18.5	28.3	18.9	28.2	19.0	27.9	19.5	27.5	20.0	34
35	29.7	18.5	29.4	19.1	29.1	19.4	29.0	19.6	28.7	20.1	28.3	20.6	35
36	30.5	19.1	30.2	19.6	29.9	20.0	29.8	20.1	29.5	20.6	29.1	21.2	36
37	31.4	19.6	31.0	20.1	30.8	20.6	30.7	20.7	30.3	21.2	29.9	21.7	37
38	32.2	20.1	31.9	20.7	31.6	21.1	31.5	21.2	31.1	21.8	30.7	22.3	38
39	33.1	20.7	32.7	21.2	32.4	21.7	32.3	21.8	32.0	22.4	31.6	22.9	39
40	33.9	21.2	33.6	21.8	33.3	22.2	33.2	22.4	32.8	22.9	32.4	23.5	40
41	34.8	21.7	34.4	22.3	34.1	22.8	34.0	22.9	33.6	23.5	33.2	24.1	41
42	35.6	22.3	35.2	22.9	34.9	23.3	34.8	23.5	34.4	24.1	34.0	24.7	42
43	36.5	22.8	36.1	23.4	35.8	23.9	35.6	24.0	35.3	24.7	34.8	25.3	43
44	37.3	23.3	36.9	24.0	36.6	24.4	36.5	24.6	36.0	25.2	35.6	25.9	44
45	38.2	23.8	37.7	24.5	37.4	25.0	37.3	25.2	36.9	25.8	36.4	26.5	45
46	39.0	24.4	38.6	25.1	38.2	25.5	38.1	25.7	37.7	26.4	37.2	27.0	46
47	39.9	24.9	39.4	25.6	39.1	26.1	39.0	26.3	38.5	27.0	38.0	27.6	47
48	40.7	25.4	40.3	26.1	39.9	26.7	39.8	26.8	39.3	27.5	38.8	28.2	48
49	41.6	26.0	41.1	26.7	40.7	27.2	40.6	27.4	40.1	28.1	39.6	28.8	49
50	42.4	26.5	41.9	27.2	41.6	27.8	41.4	28.0	41.0	28.7	40.4	29.4	50
	Dep Lat	Dep Lat	Dep Lat	Dep Lat	Dep Lat	Dep Lat	Dep Lat	Dep Lat	Dep Lat	Dep Lat	Dep Lat	Dep Lat	
	32 Deg.	33 Deg.	34 Deg.	35 Deg.	36 Deg.	37 Deg.	38 Deg.	39 Deg.	40 Deg.	41 Deg.	42 Deg.	43 Deg.	

Of LATITUDE and DEPARTURE,

105

Diff.	32 Deg.		33 Deg.		3 Points		34 Deg.		35 Deg.		36 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	43.2	27.0	42.8	27.8	42.4	28.3	42.3	28.5	41.8	29.3	41.3	30.0	51
2	44.1	27.6	43.6	28.3	43.2	28.9	43.1	29.1	42.6	29.8	42.1	30.6	52
3	44.9	28.1	44.5	28.9	44.1	29.4	43.9	29.6	43.4	30.4	42.9	31.2	53
4	45.8	28.6	45.3	29.4	44.9	30.0	44.8	30.2	44.2	31.0	43.7	31.7	54
5	46.6	29.1	46.1	30.0	45.7	30.6	45.6	30.8	45.1	31.5	44.5	32.3	55
6	47.5	29.7	47.0	30.5	46.6	31.1	46.4	31.3	45.9	32.1	45.3	32.9	56
7	48.3	30.2	47.8	31.0	47.4	31.7	47.3	31.9	46.7	32.7	46.1	33.5	57
8	49.2	30.7	48.6	31.6	48.2	32.2	48.1	32.4	47.5	33.3	46.9	34.1	58
9	50.0	31.3	49.5	32.1	49.1	32.8	48.9	33.0	48.3	33.8	47.7	34.7	59
10	50.9	31.8	50.3	32.7	49.9	33.3	49.7	33.6	49.2	34.4	48.5	35.3	60
11	51.7	32.3	51.2	33.2	50.7	33.9	50.5	34.1	50.0	35.0	49.3	35.9	61
12	52.6	32.8	52.0	33.8	51.6	34.4	51.4	34.7	50.8	35.6	50.2	36.4	62
13	53.4	33.4	52.8	34.3	52.4	35.0	52.2	35.2	51.6	36.1	51.0	37.0	63
14	54.3	33.9	53.7	34.9	53.2	35.6	53.1	35.8	52.4	36.7	51.8	37.6	64
15	55.1	34.4	54.5	35.4	54.0	36.1	53.9	36.3	53.2	37.3	52.6	38.2	65
16	56.0	35.0	55.4	35.9	54.9	36.7	54.7	36.9	54.1	37.9	53.4	38.8	66
17	56.8	35.5	56.2	36.5	55.7	37.2	55.5	37.5	54.9	38.4	54.2	39.4	67
18	57.7	36.0	57.0	37.0	56.5	37.8	56.4	38.0	55.7	39.0	55.0	40.0	68
19	58.5	36.6	57.9	37.6	57.4	38.3	57.2	38.6	56.5	39.6	55.8	40.6	69
20	59.4	37.1	58.7	38.1	58.2	38.9	58.0	39.1	57.3	40.2	56.6	41.1	70
21	60.2	37.6	59.5	38.7	59.0	39.4	58.9	39.7	58.2	40.7	57.4	41.7	71
22	61.1	38.2	60.4	39.2	59.9	40.0	59.7	40.3	59.0	41.3	58.2	42.3	72
23	61.9	38.7	61.2	39.8	60.7	40.6	60.5	40.8	59.8	41.9	59.1	42.9	73
24	62.8	39.2	62.1	40.3	61.5	41.1	61.3	41.4	60.6	42.4	59.9	43.5	74
25	63.6	39.7	62.9	40.8	62.4	41.7	62.2	41.9	61.4	43.0	60.7	44.1	75
26	64.4	40.3	63.7	41.4	63.2	42.2	63.0	42.5	62.3	43.6	61.5	44.7	76
27	65.3	40.8	64.6	41.9	64.0	42.8	63.8	43.1	63.1	44.2	62.3	45.3	77
28	66.1	41.3	65.4	42.5	64.9	43.3	64.7	43.6	63.9	44.7	63.1	45.8	78
29	67.0	41.9	66.3	43.0	65.7	43.9	65.5	44.2	64.7	45.3	63.9	46.4	79
30	67.8	42.4	67.1	43.6	66.5	44.4	66.3	44.7	65.5	45.9	64.7	47.0	80
31	68.7	42.9	67.9	44.1	67.4	45.0	67.1	45.3	66.4	46.5	65.5	47.6	81
32	69.5	43.4	68.8	44.7	68.2	45.6	68.0	45.9	67.2	47.0	66.3	48.2	82
33	70.4	44.0	69.6	45.2	69.0	46.1	68.8	46.4	68.0	47.6	67.1	48.8	83
34	71.2	44.5	70.5	45.7	69.8	46.7	69.6	47.0	68.8	48.2	68.0	49.4	84
35	72.1	45.0	71.3	46.3	70.7	47.2	70.5	47.5	69.6	48.8	68.8	50.0	85
36	72.9	45.6	72.1	46.8	71.5	47.8	71.3	48.1	70.5	49.3	69.6	50.5	86
37	73.8	46.1	73.0	47.4	72.3	48.3	72.1	48.6	71.3	49.9	70.4	51.1	87
38	74.6	46.6	73.8	47.9	73.2	48.9	73.0	49.2	72.1	50.5	71.2	51.7	88
39	75.5	47.2	74.6	48.5	74.0	49.4	73.8	49.8	72.9	51.0	72.0	52.3	89
40	76.3	47.7	75.5	49.0	74.8	50.0	74.6	50.3	73.7	51.6	72.8	52.9	90
41	77.2	48.2	76.3	49.6	75.7	50.6	75.4	50.9	74.5	52.2	73.6	53.5	91
42	78.0	48.7	77.2	50.1	76.5	51.1	76.3	51.4	75.4	52.8	74.4	54.1	92
43	78.9	49.3	78.0	50.6	77.3	51.7	77.1	52.0	76.2	53.3	75.2	54.7	93
44	79.7	49.8	78.8	51.2	78.2	52.2	77.9	52.6	77.0	53.9	76.0	55.3	94
45	80.6	50.3	79.7	51.7	79.0	52.8	78.8	53.1	77.8	54.5	76.9	55.8	95
46	81.4	50.9	80.5	52.3	79.8	53.3	79.6	53.7	78.6	55.1	77.7	56.4	96
47	82.3	51.4	81.4	52.8	80.7	53.9	80.4	54.2	79.5	55.6	78.5	57.0	97
48	83.1	51.9	82.2	53.4	81.5	54.4	81.2	54.8	80.3	56.2	79.3	57.6	98
49	84.0	52.5	83.0	53.9	82.3	55.0	82.1	55.4	81.1	56.8	80.1	58.2	99
50	84.8	53.0	83.9	54.5	83.1	55.6	82.9	55.9	81.9	57.4	80.9	58.8	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	38 Deg.		37 Deg.		5 Points		36 Deg.		35 Deg.		34 Deg.		

Diff.	34 Point		37 Deg		38 Deg.		39 Deg		3 Point		40 Deg.		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	00.8	00.6	1
2	01.6	01.2	01.6	01.2	01.6	01.2	01.6	01.3	01.5	01.3	01.5	01.3	2
3	02.4	01.8	02.4	01.8	02.4	01.8	02.3	01.9	02.3	01.9	02.3	01.9	3
4	03.2	02.4	03.2	02.4	03.2	02.5	03.1	02.5	03.1	02.5	03.1	02.6	4
5	04.0	03.0	04.0	03.0	03.9	03.1	03.0	03.1	03.0	03.2	03.8	03.2	5
6	05.8	03.6	04.8	03.6	04.7	03.7	04.7	03.8	04.6	03.8	04.6	03.9	6
7	06.6	04.2	05.6	04.2	05.5	04.3	05.4	04.4	05.4	04.4	05.4	04.5	7
8	07.4	04.8	06.4	04.8	06.3	04.9	06.2	05.0	06.2	05.1	06.1	05.1	8
9	07.2	05.4	07.2	05.4	07.1	05.5	07.0	05.7	07.0	05.7	06.9	05.8	9
10	08.0	06.0	08.0	06.0	07.9	06.2	07.8	06.3	07.7	06.3	07.7	06.4	10
11	08.8	06.6	08.8	06.6	08.7	06.8	08.5	06.9	08.5	07.0	08.4	07.1	11
12	09.6	07.1	09.6	07.2	09.5	07.4	09.3	07.6	09.3	07.6	09.2	07.7	12
13	10.4	07.7	10.4	07.8	10.2	08.0	10.1	08.2	10.0	08.2	10.0	08.4	13
14	11.2	08.3	11.2	08.4	11.0	08.6	10.9	08.8	10.8	08.9	10.7	09.0	14
15	12.0	08.9	12.0	09.0	11.8	09.2	11.7	09.4	11.6	09.5	11.5	09.6	15
16	12.9	09.5	12.8	09.6	12.6	09.7	12.4	10.1	12.4	10.1	12.3	10.3	16
17	13.7	10.1	13.6	10.2	13.4	10.5	13.2	10.7	13.1	10.8	13.0	10.9	17
18	14.5	10.7	14.4	10.8	14.2	11.1	14.0	11.3	13.9	11.4	13.8	11.6	18
19	15.3	11.3	15.2	11.4	15.0	11.7	14.8	12.0	14.7	12.1	14.6	12.2	19
20	16.1	11.9	16.0	12.0	15.8	12.3	15.5	12.6	15.5	12.7	15.3	12.9	20
21	16.9	12.5	16.8	12.6	16.5	12.9	16.3	13.2	16.2	13.3	16.1	13.5	21
22	17.7	13.1	17.6	13.2	17.3	13.5	17.1	13.8	17.0	14.0	16.9	14.1	22
23	18.5	13.7	18.4	13.8	18.1	14.2	17.9	14.5	17.8	14.6	17.6	14.8	23
24	19.3	14.3	19.2	14.4	18.9	14.8	18.6	15.1	18.6	15.2	18.4	15.4	24
25	20.1	14.9	20.0	15.0	19.7	15.4	19.4	15.7	19.3	15.9	19.1	16.1	25
26	20.9	15.5	20.8	15.6	20.5	16.0	20.2	16.4	20.1	16.5	19.9	16.7	26
27	21.7	16.1	21.6	16.2	21.3	16.6	21.0	17.0	20.9	17.1	20.7	17.4	27
28	22.5	16.7	22.4	16.8	22.1	17.2	21.8	17.6	21.6	17.8	21.4	18.0	28
29	23.3	17.3	23.2	17.5	22.9	17.9	22.5	18.2	22.4	18.4	22.2	18.6	29
30	24.1	17.9	24.0	18.1	23.0	18.5	23.3	18.9	23.2	19.0	23.0	19.3	30
31	24.9	18.5	24.8	18.7	24.4	19.1	24.1	19.5	24.0	19.7	23.7	19.9	31
32	25.7	19.1	25.6	19.3	25.2	19.7	24.9	20.1	24.7	20.3	24.5	20.6	32
33	26.5	19.7	26.4	19.9	26.0	20.3	25.6	20.8	25.5	20.9	25.3	21.2	33
34	27.3	20.3	27.2	20.5	26.8	20.9	26.4	21.4	26.3	21.6	26.0	21.9	34
35	28.1	20.8	28.0	21.1	27.6	21.5	27.2	22.0	27.1	22.2	26.8	22.5	35
36	28.9	21.4	28.7	21.7	28.4	22.2	28.0	22.7	27.8	22.8	27.6	23.1	36
37	29.7	22.0	29.5	22.3	29.2	22.8	28.8	23.3	28.6	23.5	28.3	23.8	37
38	30.5	22.6	30.3	22.9	29.9	23.4	29.5	23.9	29.4	24.1	29.1	24.4	38
39	31.3	23.2	31.1	23.5	30.7	24.0	30.3	24.5	30.1	24.7	29.9	25.1	39
40	32.1	23.8	31.9	24.1	31.5	24.6	31.1	25.2	30.9	25.4	30.6	25.7	40
41	32.9	24.4	32.7	24.7	32.3	25.2	31.9	25.8	31.7	26.0	31.4	26.4	41
42	33.7	25.0	33.5	25.3	33.1	25.9	32.6	26.4	32.5	26.6	32.2	27.0	42
43	34.5	25.6	34.3	25.9	33.9	26.5	33.4	27.1	33.2	27.3	32.9	27.6	43
44	35.3	26.2	35.1	26.5	34.7	27.1	34.2	27.7	34.0	27.9	33.7	28.3	44
45	36.1	26.8	35.9	27.1	35.5	27.7	35.0	28.3	34.8	28.5	34.5	28.9	45
46	36.9	27.4	36.7	27.7	36.2	28.3	35.7	28.9	35.6	29.2	35.2	29.6	46
47	37.7	28.0	37.5	28.3	37.0	28.9	36.5	29.6	36.3	29.8	36.0	30.2	47
48	38.6	28.6	38.3	28.9	37.8	29.6	37.3	30.2	37.1	30.5	36.8	30.9	48
49	39.4	29.2	39.1	29.5	38.6	30.2	38.1	30.8	37.9	31.1	37.5	31.5	49
50	40.2	29.8	40.0	30.1	39.5	30.8	38.9	31.5	38.6	31.7	38.3	32.1	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	34 Point		37 Deg.		38 Deg.		39 Deg.		3 Point		40 Deg.		

Of LATITUDE and DEPARTURE.

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D P	34 Point		37 Deg.		38 Deg.		39 Deg.		3 Point		40 Deg.		D P
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	41.0	30.4	40.7	30.7	40.2	31.4	39.6	32.1	39.4	32.4	39.1	32.8	51
52	41.8	31.0	41.5	31.3	41.0	32.0	40.4	32.7	40.2	33.0	39.8	33.4	52
53	42.6	31.6	42.3	31.9	41.8	32.6	41.2	33.4	41.0	33.6	40.6	34.1	53
54	43.4	32.2	43.1	32.5	42.6	33.2	42.0	34.0	41.7	34.3	41.4	34.7	54
55	44.2	32.8	43.9	33.1	43.3	33.9	42.7	34.6	42.5	34.9	42.1	35.4	55
56	45.0	33.4	44.7	33.7	44.1	34.5	43.5	35.2	43.3	35.5	42.9	36.0	56
57	45.8	34.0	45.5	34.3	44.9	35.1	44.3	35.9	44.1	36.2	43.7	36.6	57
58	46.6	34.5	46.3	34.9	45.7	35.7	45.1	36.5	44.8	36.8	44.4	37.3	58
59	47.4	35.1	47.1	35.5	46.5	36.3	45.8	37.1	45.6	37.4	45.2	37.9	59
60	48.2	35.7	47.9	36.1	47.3	36.9	46.6	37.8	46.4	38.1	46.0	38.6	60
61	49.0	36.3	48.7	36.7	48.1	37.6	47.4	38.4	47.2	38.7	46.7	39.2	61
62	49.8	36.9	49.5	37.3	48.9	38.2	48.2	39.0	47.9	39.3	47.5	39.9	62
63	50.6	37.5	50.3	37.9	49.6	38.8	49.0	39.6	48.7	40.0	48.3	40.5	63
64	51.4	38.1	51.1	38.5	50.4	39.4	49.7	40.3	49.5	40.6	49.0	41.1	64
65	52.2	38.7	51.9	39.1	51.2	40.0	50.5	40.9	50.2	41.2	49.8	41.8	65
66	53.0	39.3	52.7	39.7	52.0	40.6	51.3	41.5	51.0	41.9	50.6	42.4	66
67	53.8	39.9	53.5	40.3	52.8	41.3	52.1	42.2	51.8	42.5	51.3	43.1	67
68	54.6	40.5	54.3	40.9	53.6	41.9	52.8	42.8	52.6	43.1	52.1	43.7	68
69	55.4	41.1	55.1	41.5	54.4	42.5	53.6	43.4	53.3	43.8	52.9	44.4	69
70	56.2	41.7	55.9	42.1	55.2	43.1	54.4	44.1	54.1	44.4	53.6	45.0	70
71	57.0	42.3	56.7	42.7	55.9	43.7	55.2	44.7	54.9	45.0	54.4	45.6	71
72	57.8	42.9	57.5	43.3	56.7	44.3	56.0	45.3	55.7	45.7	55.2	46.3	72
73	58.6	43.5	58.3	43.9	57.5	44.9	56.7	45.9	56.4	46.3	55.9	46.9	73
74	59.4	44.1	59.1	44.5	58.3	45.6	57.5	46.6	57.2	46.9	56.7	47.6	74
75	60.2	44.7	59.9	45.1	59.1	46.2	58.3	47.2	58.0	47.6	57.5	48.2	75
76	61.0	45.3	60.7	45.7	59.9	46.8	59.1	47.8	58.7	48.2	58.2	48.8	76
77	61.8	45.9	61.5	46.3	60.7	47.4	59.8	48.5	59.5	48.8	59.0	49.5	77
78	62.6	46.5	62.3	46.9	61.5	48.0	60.6	49.1	60.3	49.5	59.7	50.1	78
79	63.5	47.1	63.1	47.5	62.3	48.6	61.4	49.7	61.1	50.1	60.5	50.8	79
80	64.3	47.7	63.9	48.1	63.0	49.3	62.2	50.3	61.8	50.8	61.3	51.4	80
81	65.1	48.3	64.7	48.7	63.8	49.9	62.9	51.0	62.6	51.4	62.0	52.1	81
82	65.9	48.8	65.5	49.3	64.6	50.5	63.7	51.6	63.4	52.0	62.8	52.7	82
83	66.7	49.4	66.3	49.9	65.4	51.1	64.5	52.2	64.2	52.7	63.6	53.4	83
84	67.5	50.0	67.1	50.6	66.2	51.7	65.3	52.9	64.9	53.3	64.3	54.0	84
85	68.3	50.6	67.9	51.2	67.0	52.3	66.1	53.5	65.7	53.9	65.1	54.6	85
86	69.1	51.2	68.7	51.8	67.8	52.9	66.8	54.1	66.5	54.6	65.9	55.3	86
87	69.9	51.8	69.5	52.4	68.6	53.6	67.6	54.7	67.3	55.2	66.6	55.9	87
88	70.7	52.4	70.3	53.0	69.3	54.2	68.4	55.4	68.0	55.8	67.4	56.6	88
89	71.5	53.0	71.1	53.6	70.1	54.8	69.2	56.0	68.8	56.5	68.2	57.2	89
90	72.3	53.6	71.9	54.2	70.9	55.4	69.9	56.6	69.6	57.1	68.9	57.9	90
91	73.1	54.2	72.7	54.8	71.7	56.0	70.7	57.3	70.3	57.7	69.7	58.5	91
92	73.9	54.8	73.5	55.4	72.5	56.6	71.5	57.9	71.1	58.4	70.5	59.1	92
93	74.7	55.4	74.3	56.0	73.3	57.3	72.3	58.5	71.9	59.0	71.2	59.8	93
94	75.5	56.0	75.1	56.6	74.1	57.9	73.0	59.2	72.7	59.6	72.0	60.4	94
95	76.3	56.6	75.9	57.2	74.9	58.5	73.8	59.8	73.4	60.3	72.8	61.1	95
96	77.1	57.2	76.7	57.8	75.6	59.1	74.6	60.4	74.2	60.9	73.5	61.7	96
97	77.9	57.8	77.5	58.4	76.4	59.7	75.4	61.0	75.0	61.5	74.3	62.4	97
98	78.7	58.4	78.3	59.0	77.2	60.3	76.2	61.7	75.8	62.2	75.1	63.0	98
99	79.5	59.0	79.1	59.6	78.0	61.0	76.9	62.3	76.5	62.8	75.8	63.6	99
100	80.3	59.6	79.9	60.2	78.8	61.6	77.7	62.9	77.3	63.4	76.6	64.3	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	4 Point		51 Deg.		52 Deg.		51 Deg.		4 Point		50 Deg.		

Dist.	41 Deg.		42 Deg.		43 Point		43 Deg.		44 Deg.		4 Points		Dist.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
1	00.8	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	00.7	1
2	01.5	01.3	01.5	01.3	01.5	01.3	01.5	01.4	01.4	01.4	01.4	01.4	2
3	02.3	02.0	02.2	02.0	02.2	02.0	02.2	02.0	02.2	02.1	02.1	02.1	3
4	03.0	02.6	03.0	02.7	03.0	02.7	03.0	02.7	02.9	02.8	02.8	02.8	4
5	03.8	03.3	03.7	03.3	03.7	03.4	03.7	03.4	03.6	03.5	03.5	03.5	5
6	04.5	03.9	04.5	04.0	04.4	04.0	04.4	04.1	04.3	04.2	04.2	04.2	6
7	05.3	04.6	05.2	04.7	05.2	04.7	05.1	04.8	05.0	04.9	04.9	04.9	7
8	06.0	05.2	05.9	05.4	05.9	05.4	05.9	05.5	05.8	05.6	05.7	05.7	8
9	06.8	05.9	06.7	06.0	06.7	06.0	06.6	06.1	06.5	06.3	06.4	06.4	9
10	07.5	06.6	07.4	06.7	07.4	06.7	07.3	06.8	07.2	06.9	07.1	07.1	10
11	08.3	07.2	08.2	07.4	08.2	07.4	08.0	07.5	07.9	07.6	07.8	07.8	11
12	09.1	07.9	08.9	08.0	08.9	08.1	08.8	08.2	08.6	08.3	08.5	08.5	12
13	09.8	08.5	09.7	08.7	09.6	08.7	09.5	08.9	09.3	09.0	09.2	09.2	13
14	10.6	09.2	10.4	09.4	10.4	09.4	10.2	09.5	10.1	09.7	09.9	09.9	14
15	11.3	09.8	11.1	10.0	11.1	10.1	11.0	10.2	10.8	10.4	10.6	10.6	15
16	12.1	10.5	11.9	10.7	11.9	10.7	11.7	10.9	11.5	11.1	11.3	11.3	16
17	12.8	11.2	12.6	11.4	12.6	11.4	12.4	11.6	12.2	11.8	12.0	12.0	17
18	13.6	11.8	13.4	12.0	13.3	12.1	13.2	12.3	12.9	12.5	12.7	12.7	18
19	14.3	12.5	14.1	12.7	14.1	12.8	13.9	13.0	13.7	13.2	13.4	13.4	19
20	15.1	13.1	14.9	13.4	14.8	13.4	14.6	13.6	14.4	13.9	14.1	14.1	20
21	15.8	13.8	15.6	14.0	15.6	14.1	15.4	14.3	15.1	14.6	14.8	14.8	21
22	16.6	14.4	16.3	14.7	16.3	14.8	16.1	15.0	15.8	15.3	15.6	15.6	22
23	17.4	15.1	17.1	15.4	17.0	15.4	16.8	15.7	16.5	16.0	16.3	16.3	23
24	18.1	15.7	17.8	16.1	17.8	16.1	17.6	16.4	17.3	16.7	17.0	17.0	24
25	18.9	16.4	18.6	16.7	18.5	16.8	18.3	17.1	18.0	17.4	17.7	17.7	25
26	19.6	17.1	19.3	17.4	19.3	17.5	19.0	17.7	18.7	18.1	18.4	18.4	26
27	20.4	17.7	20.1	18.1	20.0	18.1	19.7	18.4	19.4	18.8	19.1	19.1	27
28	21.1	18.4	20.8	18.7	20.7	18.8	20.5	19.1	20.1	19.5	19.8	19.8	28
29	21.9	19.0	21.5	19.4	21.5	19.5	21.2	19.8	20.9	20.1	20.5	20.5	29
30	22.6	19.7	22.3	20.1	22.2	20.1	21.9	20.5	21.6	20.8	21.2	21.2	30
31	23.4	20.3	23.0	20.7	23.0	20.8	22.7	21.1	22.3	21.5	21.9	21.9	31
32	24.1	21.0	23.8	21.4	23.7	21.5	23.4	21.8	23.0	22.2	22.6	22.6	32
33	24.9	21.7	24.5	22.1	24.5	22.2	24.1	22.5	23.7	22.9	23.3	23.3	33
34	25.7	22.3	25.3	22.7	25.2	22.8	24.9	23.2	24.5	23.6	24.0	24.0	34
35	26.4	23.0	26.0	23.4	25.9	23.5	25.6	23.9	25.2	24.3	24.7	24.7	35
36	27.2	23.6	26.8	24.1	26.7	24.2	26.3	24.6	25.9	25.0	25.5	25.5	36
37	27.9	24.3	27.5	24.8	27.4	24.8	27.0	25.2	26.6	25.7	26.2	26.2	37
38	28.7	24.9	28.2	25.4	28.2	25.5	27.8	25.9	27.3	26.4	26.9	26.9	38
39	29.4	25.6	29.0	26.1	28.9	26.2	28.5	26.6	28.1	27.1	27.6	27.6	39
40	30.2	26.2	29.7	26.8	29.6	26.9	29.3	27.3	28.8	27.8	28.3	28.3	40
41	30.9	26.9	30.5	27.4	30.4	27.5	30.0	28.0	29.5	28.5	29.0	29.0	41
42	31.7	27.6	31.2	28.1	31.1	28.2	30.7	28.6	30.2	29.2	29.7	29.7	42
43	32.5	28.2	32.0	28.8	31.8	28.9	31.4	29.3	30.9	29.9	30.4	30.4	43
44	33.2	28.9	32.7	29.4	32.6	29.5	32.2	30.0	31.6	30.6	31.1	31.1	44
45	34.0	29.5	33.4	30.1	33.3	30.2	32.9	30.7	32.4	31.3	31.8	31.8	45
46	34.7	30.2	34.2	30.8	34.1	30.9	33.6	31.4	33.1	32.0	32.5	32.5	46
47	35.5	30.8	34.9	31.4	34.8	31.6	34.4	32.1	33.8	32.6	33.2	33.2	47
48	36.3	31.5	35.7	32.1	35.6	32.2	35.1	32.7	34.5	33.3	33.9	33.9	48
49	37.0	32.1	36.4	32.8	36.3	32.9	35.8	33.4	35.2	34.0	34.6	34.6	49
50	37.8	32.8	37.2	33.5	37.0	33.6	36.6	34.1	36.0	34.7	35.4	35.4	50
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	41 Deg.	42 Deg.	43 Point	43 Deg.	44 Deg.	4 Points							

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Diff.	41 Deg.		42 Deg.		3 1/2 Point		43 Deg.		44 Deg.		4 Points		Diff.
	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	
51	38.5	33.5	37.9	34.1	37.8	34.3	37.3	34.8	36.7	35.4	36.1	36.1	51
52	39.2	34.1	38.6	34.8	38.5	34.9	38.0	35.5	37.4	36.1	36.8	36.8	52
53	40.0	34.8	39.4	35.5	39.3	35.6	38.8	36.1	38.1	36.8	37.5	37.5	53
54	40.8	35.4	40.1	36.1	40.0	36.3	39.5	36.8	38.8	37.5	38.2	38.2	54
55	41.5	36.1	40.9	36.8	40.8	36.9	40.2	37.5	39.6	38.2	38.9	38.9	55
56	42.3	36.7	41.6	37.5	41.5	37.6	41.0	38.2	40.3	38.9	39.6	39.6	56
57	43.0	37.4	42.4	38.1	42.2	38.3	41.7	38.9	41.0	39.6	40.3	40.3	57
58	43.8	38.1	43.1	38.8	43.0	39.0	42.4	39.6	41.7	40.3	41.0	41.0	58
59	44.5	38.7	43.8	39.5	43.7	39.6	43.2	40.2	42.4	41.0	41.7	41.7	59
60	45.3	39.4	44.6	40.1	44.5	40.3	43.9	40.9	43.2	41.7	42.4	42.4	60
61	46.0	40.0	45.3	40.8	45.2	41.0	44.6	41.6	43.9	42.4	43.1	43.1	61
62	46.8	40.7	46.1	41.5	45.9	41.6	45.3	42.3	44.6	43.1	43.8	43.8	62
63	47.5	41.3	46.8	42.2	46.7	42.3	46.1	43.0	45.3	43.8	44.5	44.5	63
64	48.3	42.0	47.6	42.8	47.4	43.0	46.8	43.6	46.0	44.5	45.3	45.3	64
65	49.1	42.6	48.3	43.5	48.2	43.7	47.5	44.3	46.8	45.2	46.0	46.0	65
66	49.8	43.3	49.0	44.2	48.9	44.3	48.3	45.0	47.5	45.8	46.7	46.7	66
67	50.6	44.0	49.8	44.8	49.6	45.0	49.0	45.7	48.2	46.5	47.4	47.4	67
68	51.3	44.6	50.5	45.5	50.4	45.7	49.7	46.4	49.9	47.2	48.1	48.1	68
69	52.1	45.3	51.3	46.2	51.1	46.3	50.5	47.1	49.6	47.9	48.8	48.8	69
70	52.8	45.9	52.0	46.8	51.9	47.0	51.2	47.7	50.4	48.6	49.5	49.5	70
71	53.6	46.6	52.8	47.5	52.6	47.7	51.9	48.4	51.1	49.3	50.2	50.2	71
72	54.3	47.2	53.5	48.2	53.4	48.4	52.7	49.1	51.8	50.0	50.9	50.9	72
73	55.1	47.9	54.2	48.8	54.1	49.0	53.4	49.8	52.5	50.7	51.6	51.6	73
74	55.8	48.6	55.0	49.5	54.8	49.7	54.1	50.5	53.2	51.4	52.3	52.3	74
75	56.6	49.2	55.7	50.2	55.6	50.4	54.9	51.1	53.9	52.1	53.0	53.0	75
76	57.4	49.9	56.5	50.9	56.3	51.0	55.6	51.8	54.7	52.8	53.7	53.7	76
77	58.1	50.5	57.2	51.5	57.1	51.7	56.3	52.5	55.4	53.5	54.4	54.4	77
78	58.9	51.2	58.0	52.2	57.8	52.4	57.0	53.2	56.1	54.2	55.2	55.2	78
79	59.6	51.8	58.7	52.9	58.5	53.1	57.8	53.9	56.8	54.9	55.9	55.9	79
80	60.4	52.5	59.4	53.5	59.3	53.7	58.5	54.6	57.5	55.6	56.6	56.6	80
81	61.1	53.1	60.2	54.2	60.0	54.4	59.2	55.2	58.3	56.3	57.3	57.3	81
82	61.9	53.8	60.9	54.9	60.8	55.1	60.0	55.9	59.0	57.0	58.0	58.0	82
83	62.6	54.5	61.7	55.5	61.5	55.7	60.7	56.6	59.7	57.7	58.7	58.7	83
84	63.4	55.1	62.4	56.2	62.2	56.4	61.4	57.3	60.4	58.4	59.4	59.4	84
85	64.1	55.8	63.2	56.9	63.0	57.1	62.2	58.0	61.1	59.0	60.1	60.1	85
86	64.9	56.4	63.9	57.5	63.7	57.8	62.9	58.7	61.9	59.7	60.8	60.8	86
87	65.7	57.1	64.6	58.2	64.5	58.4	63.6	59.3	62.6	60.4	61.5	61.5	87
88	66.4	57.7	65.4	58.9	65.2	59.1	64.4	60.0	63.3	61.1	62.2	62.2	88
89	67.2	58.4	66.1	59.6	65.9	59.8	65.1	60.7	64.0	61.8	62.9	62.9	89
90	67.9	59.0	66.9	60.2	66.7	60.4	65.8	61.4	64.7	62.5	63.6	63.6	90
91	68.7	59.7	67.6	60.9	67.4	61.5	66.6	62.1	65.5	63.2	64.3	64.3	91
92	69.4	60.4	68.4	61.6	68.2	61.8	67.3	62.7	66.2	63.9	65.1	65.1	92
93	70.2	61.0	69.1	62.2	68.9	62.5	68.0	63.4	66.9	64.6	65.8	65.8	93
94	70.9	62.7	69.9	62.9	69.7	63.1	68.8	64.1	67.6	65.3	66.5	66.5	94
95	71.7	62.3	70.6	63.6	70.4	63.8	69.5	64.8	68.3	66.0	67.2	67.2	95
96	72.5	63.0	71.3	64.2	71.1	64.5	70.2	65.5	69.1	66.7	67.9	67.9	96
97	73.2	63.6	72.1	64.9	71.9	65.1	70.9	66.2	69.8	67.4	68.6	68.6	97
98	74.0	64.3	72.8	65.6	72.6	65.8	71.7	66.8	70.5	68.1	69.3	69.3	98
99	74.7	65.0	73.6	66.2	73.4	66.5	72.4	67.5	71.2	68.8	70.0	70.0	99
100	75.5	65.6	74.3	66.9	74.1	67.2	73.1	68.2	71.9	69.5	70.7	70.7	100
	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	Dep	Lat	
	49 Deg.		48 Deg.		4 1/2 Point		47 Deg.		46 Deg.		4 Points		

The Use and Explanation of the Table of Difference of Latitude and Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, giving the Difference of Latitude and Departure in Minutes and Tenths, to any Distance not exceeding 100 Miles to every Degree and Quarter-point of the Compass; and may be used to every greater Distance, being taken out at twice or thrice, according to the Quantity of the Distance, as shall be shewn in the Use.

The Course stands at the Head and Foot of the Table, to every Deg. and Quarter-point of the Compass; at the Head it begins at 1 deg. so 2 deg. $\frac{1}{4}$ point, &c. encreasing to 45 deg. or 4 Points. At the Foot it begins at 45 deg. or 4 Points, so 46 deg. 47 deg. $4\frac{1}{4}$ Point, &c. encreasing backwards to 90 deg. or 8 Points. The Distance stands in the two outmost Columns under the Title *Dist.* which on the Left-hand Page begins at 1 and runs to 50; on the Right-hand Page it begins at 61, and runs to 100, the Difference of Latitude and Departure stands under the Course at the Head, and over it at the Foot of the Table.

The U S E of the Table.

This Table is very useful in Navigation, especially in working a *Traverse*.

Example 1. The Course and Distance given, to find the Difference of Latitude and Departure by the Table.

Suppose a Ship sails N. N. E. 3 quarters E. 95 Miles, the Difference of Latitude and Departure are required?

On the Right-hand Page (because the Distance is above 50) and at the Top (because it is less than 4 Points) look for $2\frac{3}{4}$ Points, which is the Course; under which, and against 95 the Distance, and under the Title *Lat.* stands 81.5, which is 81 min. $\frac{5}{10}$ the Difference of Latitude, and under the Title *Dep.* stands 48.8, which is 48 min. $\frac{8}{10}$ the Departure required?

Example 2. Suppose a Ship sails South 56 deg. Westerly 48 Miles, the Difference of Latitude and Departure required?

On the Left-hand Page (because the Distance is less than 50) and at the Bottom because it is more than 45d.) look for 56d. the Course; over which, and against 48 the Distance, over the Title *Lat.* stands 26.8 that is 26 min. $\frac{8}{10}$ the Difference of Latitude; and over the Title *Dep.* stands 39.8, that is 39 min. $\frac{8}{10}$ the Departure required.

Example 3. Suppose a Ship sails North West by North 160 Miles, the Difference of Latitude and Departure are required by the Table.

On the Right-hand Page at the Top, look for 3 Points, the Course. Now because the Table goes but to 100, take for 100 first; therefore under 3 Points, and against 100, under the Title *Lat.* stands 83.1 that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* stands 55.6, that

that is 55 min. $\frac{1}{3}$ the Departure; then for 60 under 3 Points, against 60 under the Title *Lat.* stands 49.9, that is 49 min. $\frac{2}{5}$ the Difference of Latitude, and under the Title *Dep.* stands 33.3, that is 33 min. $\frac{3}{10}$ the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88 $\frac{2}{5}$ the Departure required.

This Table is also useful in the Resolution of the rest of the Problems of *Plain Sailing*, which for Brevity sake are omitted here, being taught at large, in the last Edition of *Practical Navigation*; but the general Use of it is in the exact Working of a Traverse.

Example 1. Suppose a Ship bound to a certain Port, sails S. E. by S. 49 min. then SSE. half E. 52 min. then E by N. half E. 62 min. then SSW. half W. 57 min. then S. half E. 39 min. to find the Difference of Latitude and Departure the Ship hath made.

Set down the several Courses and Distances; first allowing for Leeway, if any; then proceed to look out the Difference of Latitude and Departure for each Course and Distance (by the Direction before given) in the Table, placing them in their proper Columns, *viz.*) If the Course be Northerly, the Difference of Latitude must be put in the North Column; If Southerly, in the South Column; If the Departure be Easterly it must be put in the East Column; if Westerly in the West Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and subtract the lesser Difference of Latitude and Departure from the greater, and the Remainder is the Difference of Latitude and Departure.

The TABLE.

Courses	Distances	Diff. of Latit.		Departure	
		North	South	East	West
S. E. by S.	59		40.7	27.2	
ESE. half E.	52		15.1	49.7	
E by N $\frac{1}{2}$ E.	62	06.1		61.7	
SSW half W	57		50.3		26.9
S half E	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			0.61	26.9	
			138.8	115.5	

The whole Diff. of Lat. is 138 $\frac{8}{10}$ S. the Dep. 115 $\frac{5}{10}$ E. then to find the Course and Distance, find the Lat. and Dep. in their proper Columns, but the Tables not extending so far, I take half each, *viz.* half the Diff. of Lat. 69.4, and half the Dep. 57.7, the nearest to which, in the Columns of Lat. and Dep. in the Traverse Table is 69.6 and 57.1, over which at the Top I find 3 $\frac{1}{2}$ Point for the Course South Easterly, or South East

half South, and in the Column of Dist. 90, which doubled (because I took half the two Numbers) is 180 the Distance required.

Example

The Use and Explanation of the Table of Difference of Latitude and Departure.

THIS is a Table larger and better contriv'd than any of this Nature yet extant, giving the Difference of Latitude and Departure in Minutes and Tenths, to any Distance not exceeding 100 Miles to every Degree and Quarter-point of the Compass; and may be used to every greater Distance, being taken out at twice or thrice, according to the Quantity of the Distance, as shall be shewn in the Use.

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Example 3. Suppose a Ship sails North West by North 160 Miles, the Difference of Latitude and Departure are required by the Table.

On the Right-hand Page at the Top, look for 3 Points, the Course. Now because the Table goes but to 100, take for 100 first; therefore under 3 Points, and against 100, under the Title *Lat.* stands 83.1 that is 83 min. $\frac{1}{10}$ the Difference of Latitude; and under the Title *Dep.* stands 55.6, that

that is 55 min. $\frac{1}{3}$ the Departure; then for 60 under 3 Points, against 60 under the Title *Lat.* stands 49.9, that is 49 min. $\frac{2}{3}$ the Difference of Latitude, and under the Title *Dep.* stands 33.3, that is 33 min. $\frac{1}{3}$ the Departure, then add the Difference of Latitude and Departure for 60, to the Difference of Latitude and Departure for 100, the Sum is 133 min. the Difference of Latitude, and 88 $\frac{1}{3}$ the Departure required.

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Set down the several Courses and Distances; first allowing for Leeway, if any; then proceed to look out the Difference of Latitude and Departure for each Course and Distance (by the Direction before given) in the Table, placing them in their proper Columns, *viz.* If the Course be Northerly, the Difference of Latitude must be put in the North Column; If Southerly, in the South Column; If the Departure be Easterly it must be put in the East Column; if Westerly in the West Column, as was before directed: Then having framed the Table, add up the Columns of Difference of Latitude and Departure, and subtract the lesser Difference of Latitude and Departure from the greater, and the Remainder is the Difference of Latitude and Departure.

The TABLE.

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SSW half W	57		50.3		26.9
S half E	39		38.8	03.8	
		06.1	144.9	142.4	26.9
			0.61	26.9	
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half South, and in the Column of Diff. 90, which doubled (because I took half the two Numbers) is 180 the Distance required.

Example

The Use of the Table.

Example 2. The Courses given in Degrees, which often happens, by reason of Allowance for the Variation of the Compass, and in the like Cases.

Suppose a Ship bound to a certain Port, sails 65 Miles North, 34 deg. Westerly. Then 56 Miles North, 67 deg. Westerly. Then 48 Miles South, 78 degrees Westerly. Then 54 Miles North, 23 deg. Easterly. Then 36 Miles North, 6 deg. Easterly, the Difference of Latitude and Departure are required?

The Table.

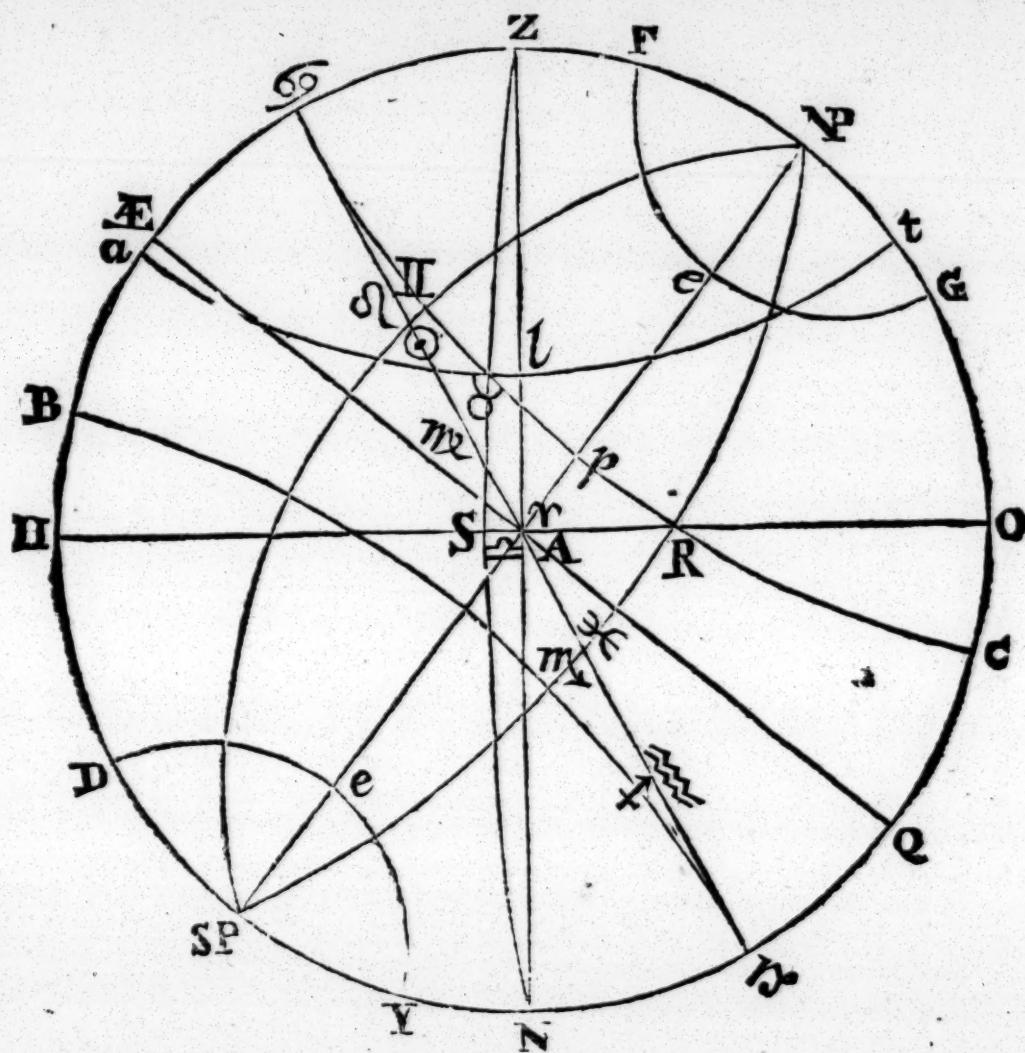
Courses.	Distances	Diff. of Latitude.		Departure.	
		North	South	East	West
NW	34° 65	53.9			36.3
NW	67° 56	21.9			51.5
SW	78° 48		10.0		47.0
NE	23° 54	49.7		21.1	
NE	6° 36	35.8		03.8	
		161.3	10.0	24.9	134.8
		10.0			24.9
		151.3			109.9

The whole Difference of Latitude is $151 \frac{1}{2}$ North, the Departure $109 \frac{1}{2}$ West. The Course and Distance is found as in the last Example.

But if you would keep a Reckoning both in Latitude and Longitude, you may also find the Difference of Longitude by the *Traverse Table*, (according to *Middle Latitude Sailing*) thus: Find the Complement of Middle Latitude in the Degrees, at the Top or Bottom of the Table, and under or above that in the Column of Departure, find your Departure, and right against that, in the Column of Distance, you have the Difference of Longitude.

Example. Suppose in the last Instance of a *Traverse*, the Ship hath sailed from Latitude 50 deg. 00 min. North, then because the Difference of Latitude is 151 min. or 2 deg. 31 min. the Latitude come to is 52 deg. 31 min. and consequently the Middle Latitude is 51 deg. 16 min. its Complement 38 deg. 44 min. which being nearest 39 deg. I look for 39 at the Head of the Table, and under it in the Column of Dep. I look for the Departure 110, but the Table not proceeding so far, I take its half, viz. 55, the nearest to which in the Table, is 54.7 (being less) against which, in the Column of Distance is 87, which doubled (because I took half the Departure) the Sum 174 min. or 2° 54' is the Difference of

Longitude required, which is sufficiently exact for common Practice ; only I would advise all Persons for avoiding as much as possible any Error, that every Time the Reckoning is corrected by an Observation, the Longitude be also corrected according to *Mercator's-Sailing*, as you are taught in the last Edition of *Practical Navigation*.



Some necessary Astronomical Definitions.

THE Poles of the Equinoctial (commonly called the Poles of the World) are two fixed Points in the Heavens, opposite one to another ; the one visible to us, called the North Pole, marked with the Letters N. P ; the other not visible to us, called the South Pole, marked with S. P.

P

The

The *Axis* of the World is a Line imagined to pass from Pole to Pole, about which is performed the diurnal Revolution, as the Line NP.A.SP.

The *Equinoctial* is a great Circle 90 deg. distant from the Poles of the World, and divides the Globe into the North and South Hemispheres; it is noted by the Letters *ÆAQ*.

The *Ecliptic* is a great Circle intersecting the Equinoctial in two opposite Points, the beginning of *Aries* and the beginning of *Libra*, and makes an Angle therewith of 23 deg. 29 min. It is divided into 12 equal Parts, called Signs, each containing 30 deg. which are as follow.

<i>Aries</i>	♈	} called Northern Signs.	<i>Libra</i>	♎	} called Southern Signs.
<i>Taurus</i>	♉		<i>Scorpio</i>	♏	
<i>Gemini</i>	♊		<i>Sagittarius</i>	♐	
<i>Cancer</i>	♋		<i>Capricornus</i>	♑	
<i>Leo</i>	♌		<i>Aquarius</i>	♒	
<i>Virgo</i>	♍		<i>Pisces</i>	♓	

The *Ecliptic* is noted by the Characters of the 12 Signs, as above.

The Poles of the *Ecliptic* are two Points 23 deg. 29 min. from the Poles of the Equinoctial, represented by G and D.

The *Zodiac* is a Zone, having about 8 Degrees of Breadth on either side of the Ecliptic, and limits the Latitude of the Planets in their Revolutions.

The *Meridians* are great Circles intersecting each other in the Poles of the World, and cutting the Equinoctial at Right-angles, as NPRSP.

The *Tropics* are two small Circles 23 deg. 29 min. distant from the Equinoctial, being parallel thereto, and limits the Sun's greatest Declination; the North Tropic being marked with ♋ C, called the Tropic of *Cancer*; the South Tropic called the Tropic of *Capricorn*, and marked with ♑ B.

The *Polar Circles* are two small Circles 23 deg. 29 min. from each Pole of the World, being parallel to the Equinoctial, as FeG and DeY.

The *Zenith* is an imaginary Point in the Heavens directly over our Heads, viz. 90 degrees distant from the Horizon, as Z.

The *Nadir* is the Point diametrically opposite to the Zenith, as N.

The *Agimuths* are great Circles intersecting each other in the Zenith and Nadir, and cutting the Horizon at Right-angles, as ZSN.

The *Horizon* is a great Circle 90 deg. distant from the Zenith and Nadir, and divides the World into the visible and invisible Hemispheres, as HAO.

The *Meridian* of a Place, is that Meridian that passeth by the Zenith and the Nadir of the said Place, and is represented by the Circle ZNPOQNSPHEZ.

Parallels of Altitude or *Almicanters*, are small Circles parallel to the Horizon; imagined to pass through any Degree of Altitude between the Horizon, and the Zenith, as alt.

Parallels

Parallels of Declination or Latitude, are small Circles parallel to the Equinoctial, and are called *Parallels of Declination*, with respect to the Heavens, and *parallels of Latitude* respecting the Earth, as *g p R C*.

The *Latitude* of a Star, is an Arch of a Circle of Longitude, contained between the Center of the Star and the Ecliptic, and is accounted either Northerly or Southerly.

The *Longitude* of a Star is an Arch of the Ecliptic, contained between a Circle of Longitude passing by the Star, and the beginning of *Aries*, and is accounted according to the Order of the Signs.

The *Declination* of the Sun or Star, is an Arch of the Meridian contained between the Center of the Sun or Star, and the Equinoctial, and is accounted either Northerly or Southerly.

The *Right Ascension* is that Degree and Minute of the Equinoctial, that comes to the Meridian with the Center of the Sun or Star.

Oblique Ascension is the Degree and Minute of the Equinoctial, that riseth with the Center of the Sun or Star.

Oblique Descension is the Degree and Minute of the Equinoctial, that sets with the Center of the Sun or Star.

Ascensional Difference is an Arch of the Equinoctial, contained between the Right and Oblique Descension or Ascension, or it is the Difference of Time between the Sun rising or Setting, and Six a Clock.

The *Amplitude*, is an Arch of the Horizon, being the Distance of the Rising or Setting of the Sun or Star from the East or West, and is accounted either Northerly or Southerly.

The *Latitude* of a Place, is the height of the Pole above the Horizon, or the distance between the Zenith and the Equinoctial.

Longitude on the Earth, is an Arch of the Equinoctial, contained between the Meridian of the Place where the Longitude is assigned to begin, and the Meridian of any other Place, and is accounted either Easterly or Westerly.

Astronomical Problems useful in Navigation.

P R O B L E M I.

THE Sun's Place and greatest Declination given, to find it's present Declination.

Example.

Suppose the Sun's Place to be 20d. 30m. in *Gemini*, the greatest Declination is 23d. 29m. it is required to find the present Declination.

The Operation by the Logarithms.

As Radius	_____	_____	_____	_____	10.000000
Is to S. Sun's greatest Declination 23d. 29m.	_____	_____	_____	_____	9.600409
So is S. Sun's Longitude 80d. 30m. from <i>Aries</i>	_____	_____	_____	_____	9.994003
To S. Sun's present Declination 23d. 09m. North	_____	_____	_____	_____	79.594412
					By

By the Gunter.

The Extent from Radius S. 90° , to S. $23^{\circ} 29'$, will reach from S. $80^{\circ} 30'$ to the S. $23^{\circ} 9'$ the Sun's Declination North, because in a Northern Sign.

Note, The Sun's Longitude is reckoned from the next Equinoctial Point, Therefore if the Sun be in *Aries, Taurus, Gemini, Capricornus, Aquaries,* or *Pisces*, the Longitude is accounted from *Aries*; but if in *Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius*, it is accounted from *Libra*.

Aries, Taurus, Gemini, Cancer, Leo, Virgo, are called Northern Signs; *Libra, Scorpio, Sagittarius, Capricornus, Aquarius, and Pisces*, are called Southern Signs. Consequently, if the Sun's Place be in any of the first six Signs, the Declination is North; but in any of the latter six, the Declination is South.

P R O B. II.

The Sun's greatest Declination and present Declination given, to find his Place.

The Sun's greatest Declination is 23d. 29m. and present Declination is 18d. 30m. North increasing, the Sun's Place required?

By the Logarithms.

As the S. of the Sun's greatest Declination 23d' 29m.	_____	9.600409
To the Radius	_____	10.000000
So is the Sine of the present Declination 18d. 30m. North	_____	9.501476
To the Sine of the Sun's Longitude 52d. 46m.	_____	9.901067

That is one Sign (39d. making a Sign) and 22d. 46m. from *Aries*, because the Declination is North and increasing, that is 22d. 46m. of *Taurus*; but if the Declination had been North decreasing, it must have been accounted from *Libra*, and then it would have been 7d. 14m. in *Leo*.

By the Gunter.

The Extent of the Compasses from the Sine 23d. 29m. the greatest Declination, to Radius S. 90° . will reach from S. 18d. 30m. the Sun's present Declination, to S. 52d. 46m. the Sun's Longitude as above.

P R O B. III.

The Sun's Place and greatest Declination given, to find the Right Ascension.

Example.

The Sun's Place $10^{\circ} 30'$ in *Aquarius*, and the Right Ascension required?

The Operation by the Logarithms.

As Radius	_____	10.000000
To the Tang. of the Sun's Longitude from <i>Aries</i> 49d. 30m.	_____	10.068501
So is the S.c. of the greatest Declination 23d. 29m.	_____	9.962453
To the Tangent of the Sun's Right Ascension 47d. 2m.	_____	10.030954

By

By the Gunter.

The Extent from Radius S. 90d. to S.c. of the greatest Declination 66d. 31m. will reach from Tangent Sun's Longitude from *Aries* 49d. 30m. to the Tangent of the Right Ascension 47d. 2m. required.

Note, This Proportion gives the Sun's Right Ascension from the next Equinoctial Point ; but it ought to be accounted from *Aries*, according to the Order and Succession of the Signs, and therefore in this Case 47d. 02m. subtracted from 360d. gives 312d. 58m. the Right Ascension from *Aries*.

P R O B. IV.

The Latitude of a Place, and the Sun's Declination given, to find the Sun's Amplitude ?

Example.

The Latitude 51d. 32m. North, and the Sun's Declination 15d. 20m. North, what is the Amplitude ?

The Operation by the Logarithms.

As S.c. of the Latitude 51d. 32m.	_____	_____	9.793832
To Radius	_____	_____	10.000000
So is the S. of the Declination 15d. 20m. North	_____	_____	9.422318
To the S. of the Sun's Amplitude 25d. 9m.	_____	_____	9.628486

By the Gunter.

The Extent from the S.c. of the Latitude 38d. 28m. to the Sine of the Declination 15d. 20m. North, will reach from Radius S. 90d. to S. 25d. 9m. the Sun's Amplitude North, as above.

Note, If the Declination be North, the Amplitude is North, and if the Declination be South, the Amplitude is also South.

P R O B. V.

The Latitude of a Place and the Sun's Declination given, to find the Ascensional Difference.

Example.

Suppose in the Latitude 51 deg. 32 min. North, the Sun's Declination is 10 deg. 45 min. North, and the Ascensional Difference required.

The Operation by the Logarithms.

As Tangent Complement Latitude 51d. 32m.	_____	_____	9.900087
To Radius	_____	_____	10.000000
So is the Tangent of the Sun's Declination 10d. 45m.	_____	_____	9.270735
To the S. of the Ascensional Difference 13 deg. 35 min.	_____	_____	9.370648

B.

By the Gunter.

The Extent from Tangent $38^{\circ} 28'$ (the Compl. of Latitude) to Tang. $10^{\circ} 45'$ min, the Sun's Declination; will reach from Radius S. 90° deg. to S. $13^{\circ} 35'$ min. the Sun's Ascensional Difference, as above.

P R O B. VI.

To find the Oblique Ascension and Descension.

First, Find the Ascensional Difference by the Fifth Problem.

Secondly, The Right Ascension by the third Problem.

When the Latitude and Sun's Declination are both North or both South, the Ascensional Difference subtracted from the Right Ascension, gives the Oblique Ascension, and added thereto, gives the Oblique Descension. But when one North and the other South, the Ascensional Difference added to the Right Ascension, gives the Oblique Ascension, and subtracted gives the Oblique Descension.

Note, That if the Ascensional Difference exceed the Right Ascension, add to the Right Ascension 360 Degrees, then subtract the Ascensional Difference therefrom.

Or, if both being added together exceed 360 d. the Excess is the Oblique Ascension or Descension.

P R O B. VII.

To find the Time of the Sun's rising and setting, and length of the Day or Night.

Find the Ascensional Difference by the Fifth Problem, which convert into Hours and Minutes of Time, accounting for 15° deg. of the Equinoctial one Hour, and for every degree 4 Minutes of Time, and for every 15 Minutes of the Equinoctial 1 Minute of Time.

1. If the Latitude and Sun's Declination are both North or both South, the Ascensional Difference added to six Hours, gives the Time of Sun-setting; and subtracted is the Time of Sun-rising.

2. But if one North and the other South contrarily, the Ascensional Difference added, gives the Time of Sun-rising; subtracted is the Time of setting.

The Time of Sun-setting doubled, gives the Length of the Day; the Time of Sun-rising doubled, is the Length of the Night.

Example.

In Latitude $51^{\circ} 32'$ North, suppose the Sun's Declination $21^{\circ} 57'$ North, the Ascensional Difference is $30^{\circ} 29'$ which reduced into Time is

H. M.

2 02

6 00

Sun setteth — 8 02

Sun riseth — 3 58

} doubled is

H. M.

16 04 length of the Day.

7 56 length of the Night.

P R O B.

P R O B. VIII.

The Latitude of a Place, the Sun's Altitude and Declination given, to find the Azimuth is required ?

The Rule.

Take the Complement of the Altitude, the Comp. of the Latitude, and the Comp. of the Declination to 90 deg. add them together, and take the half Sum ; subtract the Comp. of the Declination from the half Sum, and take the Remainder ; then set down the Compl. Arithmetical of the Sines of the Compl. Altitude, and Compl Latitude, and thereto add the Sines of the half Sum and Remainder ; half the Sum of these four Logarithms is the S.e of half the Azimuth required.

Note, If the Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement of the Declination to 90 deg. you must add 90 deg. thereto, and then proceed as before.

The Operation by the Logarithms.

d.	m.			
42	: 30	Compl. Altitude A. M.	_____	S. Co. Ar. 0.170317
38	: 28	Compl. Latitude North	_____	S. Co Ar. 0.206168
69	: 30	Compl. Declination N. or Sun's Dist. from the Pole.		

150 : 28 Sum

75	: 14	Half Sum	_____	_____	S. 9.985414
5	: 44	Excess of the half Sum above c. Del.	_____	_____	S. 8.999560

Sum 19.361459

61d.	21m	_____	Sc.	_____	_____	Half Sum 9.680729
61d.	21m.					

doubled 122d. 42m. the Sun's Azimuth from the North required.

The Operation by Gunter's-Scale.

The Extent of the Compasses from Radius S. 90 deg. to S. 42 deg. 30 min. the Complement of the Altitude, will reach from S. 38d. 28m. the Complement of the Latitude, to Sine 24 deg. 40 min. then the Extent from Sine 24 deg. 40 min. to Sine 75 deg. 14 min. the half Sum will reach from S. 5 deg. 44 min. (the Excess of the half Sum, above the Complement Declination) to 122 deg. 42 min. (upon the Line of Verfed Sines) which is the Azimuth required.

Example

Example 2. In the Latitude of 51 deg. 32 min. North, the Sun's Declination is 18 deg. 15 min. South, his Altitude 17 deg. 45 min. and the Azimuth from the North required?

The Operation by the Logarithms.

d.	m.			
72	: 15	Compl. Altitude	_____	S. Co. Ar. 0.021182
38	: 28	Compl. Latitude	_____	S. Co. Ar. 0.206168
108	: 15	Declination 90 deg. being added, because South.		
218	: 58	Sum		
109	: 29	Half Sum supp. to 180° is 70° 31' S.	_____	9.974391
1	: 14	Remainder	_____	S. _____ 8.332924
				Sum 18.534665
		d. m.		
		79 : 20	_____ S. c. _____	half Sum 9.267332
		79 : 20		

Which doubled is _____ 158 : 40 the Azimuth from the North required.

By the Gunter.

The Extent from Radius S. 90d. to the S. 72d. 15m. the Compl. Altitude, will reach from the Sine 38d. 28m. the Complement Latitude, to the S. 36d. 20m. then the Extent from the S. 36d. 20m. to S. 70d. 31m. the Supplement of 109d. 29m. the (half-sum) to 180d. will reach from the Remainder S. 1d. 14m. to 158d. 40m. (upon the Line of Versed Sines) the Sun's Azimuth as above.

In South Latitude, the Operation is the same with the two preceding Examples, only the Azimuth is found from the South.

After the same manner you may find the Azimuth of any Star.

P R O B. IX.

The Latitude of the Place, the Sun's Declination and Altitude being given, to find the Hour of the Day.

Example. In the Latitude 51 deg. 32 min. North, suppose the Sun's Declination 23 deg. 29 min. North, the Altitude 36 deg. 30 min. in the Afternoon, and the Hour from Noon required.

The Rule. Take the Complement of the Declination, the Complement of the Latitude, and the Complement of the Altitude to 90 deg. add them together, and take the half-sum, subtract the Complement of the Altitude from the half-sum, and take the Remainder, then set down the Complement

ment Arithmetical of the Sine Complement of the Declination, and Complement Latitude, and thereto add the Sines of the half Sum and Remainder : half the Sum of these four Logarithms, is the S. c. of the half Time required in Degrees and Minutes of the Equinoctial.

The Operation by the Logarithms.

d.	m.				
66	: 31	Compl. Declination	—————	S. Co. Ar.	0.037547
38	: 28	Compl. Latitude	—————	S. Co. Ar.	0.206168
53	: 30	Compl. Altitude			
158	: 29	Sum			
79	: 14	Half Sum	—————	Sine	9.992287
25	: 44	Remainder	—————	Sine	9.637673
d.	m.	.		Sum	19.873675
30	09	—	Sc.	—	Half Sum 9.936837
30	09				

which doubled is 60 18. and reduced into Time, makes 4 hours 1 min. $\frac{1}{5}$, the Hour of the Day in the Afternoon.

But if it had been in the Forenoon, 4 hours 1 min. $\frac{1}{5}$ subtracted from 12 hours, leaves 7 hours 58 min. $\frac{4}{5}$ for the Time in the Morning.

If the Declination had been Southerly, then instead of taking the Complement of the Declination to 90 deg. there must be 90 deg. added thereto, as in the second Example of the Eighth Problem ; do the same when the Declination is North in South Latitude.

By the Gunter.

The Extent of the Compasses from Radius S. 90d. to S. 66d. 31m. the Complement of the Declination, will reach from S. 38d. 28m. the Complement Latitude, to S. 34d. 40m. then the Extent from S. 34d. 40m. to the S. of 79d. 14m. the half Sum, will reach from S. 25d. 44m. the Remainder, to 60d. 18m. (upon the Line of Versed Sines) the Hour of the Day as above.

P R O B L E M X.

Having the Latitude of the Place, the Sun's Right Ascension, with the Right Ascension, Declination, and Altitude of a Star given, to find the Hour of the Night.

Q

Example

Example.

In the Latitude of 51 deg. 32 min. North, on the 7th of January 1745, the Sun's Right Ascension was 20 hours 3 min. the Right Ascension of the *Lion's Tail* was 11 hours 35 min. the Declination 16 deg. 6 min. North, the Altitude 30 deg. 30 min. to the Eastward of the Meridian, the Hour of the Night required.

The R U L E.

Take the Complement of the Star's Declination, the Complement of the Latitude of the Place, and the Complement of the Sun's Altitude; add them together, and take the half Sum, subtract the Complement of the Altitude from the half Sum, and reserve the Remainder; then set down the Complement Arithmetical of the Sines of the Complement of the Star's Declination and of the Latitude of the Place, and thereto add the Sines of half the Sum and Remainder: Half the Sum of these four Logarithms, is the Sc. of half the Distance from the Meridian.

The Operation by the Logarithms.

d.	m.				
73	: 54	Compl. Star's Declination	_____	S. Co. Ar.	0.017377
38	: 28	Comp. Latitude	_____	S. Co. Ar.	0.206168
59	: 30	Compl. Star's Altitude	_____		
171	: 52	Sum			
85	: 56	Half Sum	_____	Sine	9.998905
26	: 26	Remainder	_____	Sine	9.648512
					Sum 19.870962
30d. 28m.		_____	Sc.	_____	Half Sum 9.935481
30d. 28m.		_____			

which doubled is 60d. 56m. and reduced into Time, gives four Hours, three Minutes, forty-four Seconds, or 3 quarters of a Minute.

By the Directions given in the Use of the Table of the Sun's Right Ascension, and of the Right Ascension and Declination of the fixed Stars, find the Time of the Star's coming upon the Meridian, if the Star be to the Eastward of the Meridian subtract the Star's Distance from the Meridian in Time, from the Time of the Star's coming upon the Meridian; but

but if the Star be to the westward of the Meridian, add the Star's Distance from the Meridian, to the Time of the Star's coming to the Meridian; the Sum or Difference is the hour of the Night. In this Example, The Sun's Right Ascension 20 Hours 03 Minutes subtracted from the Star's Right Ascension (with 24 Hours added thereto) 35 Hours 36 Minutes, leaves 15 Hours 33 Minutes, the Time of the Star's coming on the Meridian; from which subtracting 4 Hours 4 Minutes nearest, leaves 11 Hour 29 Minutes; the Hour of the Night.

Note farther, If the Sun's Declination be South in North Latitude, or North in South Latitude, instead of taking the Complement Declination, to 90 deg. there must be 90 deg. added thereto, as has been shewn in the Eighth preceding Problem.

The Operation by Gunter's-Scale.

The Extent of the Compasses from Radius S. 90d. to the S. of 73 Degrees 54 Minutes the Complement of the Star's Declination, shall reach from S. 38 Degrees 28 Minutes the Complement of the Latitude, to the S. 36 Degrees 40 Minutes; then the Extent from the S. 36 Degrees 40 Minutes, to S. 85 Degrees 56 Minutes the half Sum, shall reach from S. 26 Degrees 26 Minutes the Remainder, to 60 Degrees 56 Minutes (upon the Line of Verfed Sines required;) With which proceed as has been directed to find the Hour of the Night.

Courses and Distances between some of the most eminent Places on the Coast of England, &c. As also the thwart Courses between the East Coast of England and Holland, the South Coast of England and France, and the West Coast of England and Ireland.

	Leag.
FROM <i>Whitby</i> to <i>Tinmouth</i> , NW by N. ———	14
From <i>Buchanefs</i> to <i>Cathnefs</i> , North West ———	27
From the <i>North Foreland</i> to <i>Flushing</i> , East ———	24
From the <i>North Foreland</i> to the <i>Texel</i> , North East ———	51
From the <i>Spurn</i> to the <i>Texel</i> , East by South ———	55
From <i>Tinmouth</i> to the <i>Naze of Norway</i> , NE. by E. ———	118
From <i>Tinmouth</i> to <i>Holy Land</i> , East by South ———	114
From <i>Tinmouth</i> to the <i>Scaw</i> , E.N.E. ———	110
From <i>Yarmouth</i> to the <i>Texel</i> , East by North ———	34
Q 2	From

From Newcastle to Maes Deep, E N E.	83
From Aberdeen to Maes Deep, South East	113
From the North Foreland to the Maes, E N E	30
From Newcastle to the Fly, E S E	90
From Scarborough to Holy Land, East Northerly	97
From the Start to the Eddystone, West half South	6
From the Land's End to Scilly, W S W. three quarters W.	9
From the Caskets to Blackneß, East North East	55
From Beachy to Blackneß, East a quarter North	15
From Dover to Diep, South half West	25
From the Ligard to Guernsey, East by South	35
From the Start to Seven Isles, South half East	25
From Scilly to Ushant, South East by South	35
From the Lizard to Ushant, South	27
From Hartland Point to the Island of Lundy, North	3
From Lundy to the Holms, East by North	18
From Black Rock to Tuscar, East North East	3
From Cape Clear to Old Head, East by North	13
From Gresholm to Waterford, West by North	21
From the Land's-end of England to Tuscar, North by West	40
From the Land's-end of England to Waterford, NNW.	40
From Holy Head in the Island Anglesey, to the Bar of Dublin, W by N.	18
From Rachel to Black Rock, South by East	80
From the Land's-end of England to Cape Clear, NW by W	55
From the Land's-end of England to Old Head, North West	45

A Table of the Soundings coming into the Channel, respecting the Bearing and Distances of Scilly, Ushant, the Lizard, &c. with the Depth in Fathoms and the various sorts of Ground.

Bearings.	Dist.	Lat.		Dep.	The various sorts of Ground.
		D.	M.		
South	05	50	20	50	Branny sand, like Ground Wheat
SSE	05	50	12	45	White sand mixed with shells
SSE	06			50	Coarse Owse
ESE	06			53	Coarse sand and fine red shells
E by S	08	50	12	78	Owse sand, with Queen shells amongst it
E by N	07	49	15	72	Owse like Mustard seed, with broken shells
E by N	15	48	50	72	Pepper sand, black and yellow

E by N.

Bearings.	Dist.	Lat.		Dep.	The various sorts of Ground.
		D.	M.		
E by N	24	49	50	72	Black, white, and red stones with Owse
ENE	07	49	15	60	Some black Sand
ENE	20	49	15	80	Rocky Ground
ENE	55			103	Fine white Sand
NE by E	22	49	10	85	Sand and Owse together
NE by E	10	49	20	55	White and red Sand mix'd with Shells
NE by E	50	49	50	100	White sand with Owse and Nits
NE by E	25	49	50	64	Branny sand with white and red shells
NE by E	06	49	10	48	Black sand
NE by E	13	49	43	65	Branny sand with some pieces of shells
North East	10	49	40	65	Branny sand, small stones, Herring Bones
NE by N	10	49	20	57	Small red sand
NNE	10	49	47	100	White sand then entring on the Bank
N by E	18			68	Red sand with black & white scollop shells
North	12	49	15	65	Broken shells with white and red sand
North	10	49	47	65	White sand on the E. part of the Bank
NNW	33	48	52	77	Red sand and shells amongst it
NW by N	07	49	40	54	More shells, the Lizard NE. dist. 18 leag.
North West	04	50	10	50	Branny sand with black and broken shells
North West	07	49	47	60	Stony Ground
NW by N	04	50	25	61	Red and black sand, with glistering shells
NW by W	24			44	Shells and sand like the points of Needles
W by N	13	50	25	63	Fine white sand with little Owse
West	21	50	08	66	Red and black sand with glistering shells
West by S	32	49	50	75	Fine white sand and glistering shells
West by S	31			40	Like broken Wheat or Coarse Bran
North	06	48	36	63	Full of small Mace sand
N by E	18	48	15	80	Round stones mixed with scollop shells
NE by N	11			60	Small beaten shells and Hakes Teeth
North East	29	48	50	85	Great and small pieces of Cockle shells
North East	25	48	10	55	Gray and brown sand with white shells
NE by N	07	48	30	68	White and gray Mace sand
ENE	14	48	36	68	Small shells and Herring Bones
E by N	25	48	30	85	White and gray sand with small red stones
East	18	49	00	70	Branny sand, with some shells
East	06	49	00	65	Red sand, shells things like Needles points
East	15	49	15	70	Fine white sand
East	33	49	15	87	Dazling sand like Barly straw
East	04	49	10	60	Full of Mace sand and broken shells

E. by S.

Soundings coming into the Channel.

	Bearings	Dift.	Lat.		Dep.	<i>The various sorts of Ground.</i>
			D.	M.		
Upport.	E by S	14	49	56	63	Shells like Perriwinkles
	ESE	15	48	15	70	Shells gray and red Pieces of Cockle shells
	ESE	12	49	20	68	Gross white Sand with Shells
	ESE	8	49	5	64	White Shells and fine small stones
	ESE	6			60	Hakes Teeth and shells like Oatmeal Husks
	SE by E	20	49	15	72	Great stones like Pease and Beans
	SE by E	9	49	15	65	Sand and some shells
	SE by E	37	48	30	65	James's shells
	SE by E	15	49	25	60	Small Scollop shells, with some stones

	Bearings.	Dift.	Dep.	<i>The various sorts of Ground.</i>
Lizard.	North East	6½	43	Marfhy shells and some scollop shells
	NE by N	10	52	Marfhy shells and Hakes Teeth
	NNE	9	50	Marfhy shells like Oatmeal Husks
	N by E	15	58	Marfhy shells and Hakes Teeth
	North	1	39	Stones as big as Beans four Leagues off
	North West	5	45	Gray sand like Oatmeal Flower
	North West	3	46	Marfhy shells and small stones
	WNW	3½	47	Small shingly stones, and marfhy shells
	W by N	4	40	Fine marfhy shells and white stones
	W by S	3	41	Black gravelly Ground with small stones
	NE by E	12	57	Scollop shells
	NE by E	4	44	Great stones and rough Ground
	North East	6½	50	Like Husks of Oatmeal and small stones

Eddy Stone.	N. half a Mile	35	Dirty brown sand Hakes Teeth
	W. 2 Miles	34	Dirty brown sand
	S. 1 Mile	26	Fine sand, and within this 28 and 30 Fathom

Start.	NE. by E. Nly	8½	40	{ Like the Dust of a Grindstone with Hakes Teeth and shells
	NW. by W.	4½	43	
	NW. by N.	3	38	{ Gravelly sand, small stones and shells Reddish shells mashed as if beat in a mortar, white sand and scollop shells
	N. by W. Wly	12	38	
	N. W. by W.	14	43	

Foreland

		Bearings	Dit.	Dep.	The various sorts of Ground.
<i>Forland.</i>	{	NE by E	08	35	Small shingly stones as big as Pease
		North	08	40	Streamy Ground with small stones
		N by E	5½	33	The same with some black sands
		NE by N	11	41	Fine sand and scollop shells
		NNE.	08	40	Fine sand, scollop shells and small stones
		NE by E	2½	27	Shingly Ground
		WNW	2½	20	Small stones
<i>Needles</i>	{	NE by E	02	17	Great shingly Ground
		NE half E	2½	15	Small shingly Ground
		North East	02	13	Rocky Ground
<i>I. Wright</i>	{	N by W	3½	20	All the Ground from <i>Albions</i> to the E. end of the <i>White</i> is chalky and brown sand.
		E by N	04	21	
		N by E	03	18	
<i>Dunnole</i>	{	W by S	04	16	Rough Ground with some big stones
		West	04	21	A kind of sandy fishy Ground
		WNW	08	33	{ Fishing Ground somewhat red, with stones as big as Pease, and small Beans
		N by W	06	26	

Directions to sail into some of the Principal Harbours on the Coast of England.

Directions to sail into Scilly.

SCILLY is divided into divers Islands; along the West-side lieth a great many Rocks. There are several Channels through which to go in, but the Southermost called St. *Mary's* Sound is the best, being a fair opening of the Channel, but near the midst lie two sunken Rocks, which in foul Weather the Sea may be seen to break over: It is best to leave them on the Larboard-side going in, and on the Starboard-side coming out: Go so near the Starboard-shore, as that a Stone might almost be thrown on shore. And when you are within the Point, luff up round, and come to an Anchor in the sight of the Houses; or when the Town is brought open to the Valley, leave two thirds of the Harbour on the Larboard-side.

*Directions for sailing into Mount's-Bay.**To anchor in Gover's-Lake.*

There is certainly two funken Rocks, which lie right in the way of going into the Lake, about a Mile without your Anchoring Place ; these Rocks lie N N W. and S S E. about half a Mile in length, to shun which observe as follows.

If the Wind is in the Eastern Hank give the Eastern Shore about a League Birth, and keep St. *Paul's* Church wholly in sight above the Hill, till you bring a Church on the the Eastern Shore a Sail's Breadth to the Northward of St. *Michael's Mount*, then bear away for the Lake Hill, keeping your Mark till you run St. *Paul's* Church down under the Hill, then let go your N E. Anchor, and carry the other to the S W. and you will be well moor'd, and in good fine Ground all Sand.

You may come in, keeping one half of the Church above the Hill, you'll clear them to the Eastward, and when it shuts down you are to the westward of them, and when upon them the Top of the Tower and a long Hedge is in one, about 6 or 7 foot at low Water.

If the Wind is in the southern or western Hank keep the Land on board, which is bold ; you may go within a quarter of a Mile of the Point : run till you shut *Moufehole* Island in, and St. *Paul's* Church down under the Land well, to come too with your S W. Anchor, then carry the other to the N. E. you will be well moor'd in fine Ground as before mentioned : Be sure to have the Church on the Eastern shore a Sail's Breadth to the Northward of the Mount.

If your Ground Tackling is good your Anchors will never start, the Wind at S. S. E. or S. E. heaves in a great Sea, and raises a great Ground Sea when blowing hard ; the harder it blows you have a stronger Out-fet in your Favour ; there is no Tide, you always ride Head to Wind, your Anchors will sooner start with the Wind to the N. or N. W. because the Ground goes out with a little Defcent.

To sail into Foy.

Foy may be very easily known, lying in between two high Lands ; on the West-side the going in, is an old Church and Castle, and on the East-side the Ruins of an old Church, as you may see by the making of it in Capt. *Collin's* Draught of *Foy*. The going in is a Cable's Length over from side to side, and no Danger ; when you are in you may Anchor before the Town, or run up above the Town. In the time of the *Dutch War*, in the Year 1666, there was above fixty Sail of *Virginia Ships* put into this Harbour. This Place lieth N. E. and S. W. in and out, which makes it a better Out-let to the westward than *Plymouth* or *Falmouth*. And whereas it

it hath been reported to be a Bar-Harbour, and that you cannot enter till half Tide, I do assure you that there is no less than three Fathom at low Water at a Spring Tide; here you may lie ashore to wash, tallow, or stop Leaks; the Spring Tides rise and fall 16 and 17 Foot, and it is high Water here at Full and Change a quarter past Five. There is good anchoring in the Road without the Harbour, from 5 to 10 Fathom Water, but without that Depth foul Ground.

To sail into Falmouth.

Upon the West Point of the Haven of *Falmouth*, standeth a Castle on the high Land called *Pendennis* Castle. In the Entry nearest the said West-side lieth a Rock above Water, you may sail in at either side of it, at the inner-side of the East Point lie also some Rocks off the Shore; on the East-side is deepest Water, and most Room, therefore in going in, give the East Point a large Birth; there will be 7 or 8 Fathom. Keep the said Shore till you come within *St. Maud's* Castle; which when it bears East there will be 16 or 17 Fathom, but half the Harbour over towards the *Smithick* is but 4 or 5 Fathom; observe in going in to keep the *Manacles* open and shut on the Point of *Falmouth* Castle, and so it must be kept till you shut the Church over *Penny Comquick*, into the North East end of the *Smithick*, and so bear over to *St. Maud's*, and ride with the Castle East, laying one Anchor in 18 Fathom, and the westernmost Anchor in four Fathom, as shall seem most convenient.

To sail into Plymouth.

At the Eastermost Point of *Plymouth Sound* lieth a high round Rock called *Mewstone*; between it and the *Ramhead* lieth the said *Sound*, North North East, being round and deep.

A little to the Northward of *Ramhead*, is a fair sandy Bay, where is good Anchoring close under the Land, in 9 or 10 Fathom: South a little Easterly from *Ramhead*, lies a Rock above Water called the *Eddystone*, (on which is erected a Light-house) the Point of *Plymouth* lies from it N. by E. distant about 4 Leagues.

In the *Sound*, by the Land of *Plymouth*, lieth an Island called *St. Nicholas*, or *Drake Island*, which is joined to the West-side, with a Range of Rocks under Water, so that you may sail along to the Eastward of it.

To sail into Catwater.

To sail into *Catwater*, run in between the Island and the Point on the East-side with the Land of *Plymouth*, till *Catwater* open on the Starboard side, then go in to the Eastward between the Point of *Plymouth*, and the

R

Point

To sail into some the Principal Harbours

Point on the Starboard-side, leaving most part of the Channel on the Starboard side, until you come within the Point, and anchor there right against the high steep Northern Land; there is at Low Water, with extraordinary high Tides 4 and 5 Fathom.

In sailing into *Catwater*, be sure to give a good Birth to the Southern Point of the Entry, for there lies off the said Point a Ledge of Rocks under Water, about two Cable's Length off from the Land. Upon the Point of the Ledge lies a Buoy, where is about twelve foot Water at half Flood, which Buoy must be left on the Starboard-side going in, and when *Catwater* is altogether open you may run into the Eastward, leaving in the Entry of the Harbour two thirds of the Channel on the Starboard-side, as aforesaid, because the South Shore is somewhat flat off, there lying a sandy Bank, which reacheth to the second Point of the South Shore of *Catwater*.

A little to the Eastward of *Drake Island* lies a Rock under Water, upon which at low Water it is deeper than two Fathom. To sail within the Land you may go to the Eastward or Westward of the Rock, as Occasion serves.

To sail into Dartmouth.

Dartmouth hath a narrow Entry lying in between two high Lands: On each side of the Haven standeth a little Castle; on the West-side is a Church on the high Land, called *St. Patrick's Church*. To sail in coming from the Westward, run in along by the West Land, so far to the Eastward until the Key of the Village (on the East-side of the Haven) be brought in the midst of the Entry of the Haven between the two Lands; it's convenient to have a Boat ready (if any Gust of Wind should come from the high Land) to row in. Being come in, edge over to the West-side before the Brewhouse, and anchor there in 10 or 11 Fath. or before the Village to the East-side at Pleasure. At the East-side lieth a sunken Rock, to avoid which steer in with *St. Patrick's Church*, and do not bring the Village which standeth on the West-side of the Harbour, without the said Church, but keep the outer House of the said Village in the East-side of the Chappel, always in Sight, without the Bulwarks on the North-side of *St. Patrick's Church*, then there is no Danger of the Rock, in the Range by the North Point. Between *Dartmouth* and the *Start*, nearest to *Dartmouth*, standeth a white square Steeple, called *Fackman*, which is a very good Mark to know *Dartmouth* by.

To sail into Torbay.

Bring the West Point of the *Berry S* by E. or S S E. from you; and anchor there in 7 or 8 Fathom, where you shall be Landlock'd for a S. and S. W.

S.W. Wind. At the North East end of the Bay is also a Tide Haven called the *Tormain*; before it is very good Anchor Ground in 4 or 5 Fath. according as you desire to be nearer or further from the Shore.

Directions for sailing in at the East-end of the Isle of Wight to Portsmouth Harbour, and also to Hampton.

If you come from the Eastward with a Northerly Wind, bound into the *Isle of Wight* or *Portsmouth*; after you come to the Westward of the Shoal called the *Owers*, hale in North West with St. *Hellen's* Point; but do not hale too much to the Northward, for there lies a Bank off of *Longstone* Haven, to the Eastward of the *Horse*, that hath not above 13 Foot on it at low Water; but keeping in 7 or 8 fath. carrieth you clear without it, and will bring you to the S. E. end of the Sand called the *Horse*. St. *Hellen's* Church being S. W. by W. from you, you may run in 5 Fath. and when you have brought the Westermost great white Patch, or Chalk upon *Parch Down* (which is the high Land to the Northward of *Portsmouth*) a Ship's Length to the Westward of *South-Sea Castle* that stands upon the Beach, then you may luff up without Fear: Being then to the Westward of the *Horse*, and steering with that Mark, it will lead you in along the *Horse* unto the Beach, and so into the Harbour of *Portsmouth*, keeping along close by the Shore, until you come to the Town-wall's-end, and there you must bear off a little for a Flat, that lieth off from the Shore; this is for an Easterly Wind. But if you intend for *Stokes-Bay*, when you have brought the Fire Beacon on *Brown Down*, (which is to the WNW. of *Hastewood* Point) within a Ship's Length without the said Point, then you may bear to the Westward along the out-side of the *Spithead*, which is the Shoal on the West-side of the Entrance of *Portsmouth* Haven.

If the Wind be westerly or southerly, and you are coming from the westward, and design for St. *Hellen's* Road or *Stokes-bay*, (from *Dunnose* to St. *Hellen's* Point, the Course is N. E. by N. and N. N. E.) borrow no nearer to St. *Hellen's* than 6 or 7 Fathom, for the *Spit* lies off a great way; but if it be clear Weather, that you may keep *Sand Down* Castle open of the *Culver Cliff*, that Mark will lead you without the *Spit* of the Point; steer along in this Mark, until you open St. *Hellen's* Church about two Ship's Length open of the *Red Cliff* within St. *Hellen's* Point or *Port-Sea* Castle to the Eastward of *South Sea* Castle, then are you clear of the Point, and may steer to St. *Hellen's* Road N. W. and having brought the Point S by W. or between that and the S by E. you may anchor in 7 or 8 Fathom Water on very good Ground.

Note, That you have no good clear Ground all along the Island until you have opened *St. Hellen's Church*, as aforefaid, and have brought the Point to bear from you S.S.W.

From *St. Hellen's Point*, to go between *No Man's Land* and the *Horse*, the direct Course in, is N. W. by N. and N. W. but you have no shoaling upon the S.W. side of *No Man's Land*, for you have 16 Fathom, and the next Cast but 3; but at the *Horse* you may stand into 10, 9, or 8 Fathom: If the strong Tide be spent, and smooth Water, you shall have a great washing of them by the Overfall of the Water; but especially on *No Man's Land*, if it be clear Weather, there are very good Marks to lead you in, which are as follows; keep the two Windmills on the Downs on the *Isle of Wight*, that they may be seen clear all over the Trees between you and them, but no more above them than even clear; this Mark will lead you in, and so up all along the Island without some middle Ground that lieth WSW. off the Point of *No Man's Land*.

Also from *St. Hellen's Point* (if it be clear Weather that you can see it) there is a direct Mark, viz. a part of an old Castle formerly called *Haflewood Castle*, standing on *Gilkicker Point* (which is kept white,) keep *Gosport Church* and that Castle in one, or this Castle in the middle of the Wood about the Church, which sheweth with a Valley like a Saddle, and so you may run directly in without Fear. Or if the Wind be so that you are forc'd to turn in, then you may run the said Mark within two Sail's Breadth of each End of the Wood. In the middle of the Channel is 11 Fathom Water; and if you bring the said Mark right under the North End of the Wood you shall run in a middle Ground near the *Horse* that hath not above 10 Foot on it at low Water, and hard Sand.

Being in *Yarmouth Road*, and you would sail out of the *Needles*, steer away for *Hurst-Castle*, which Place is very steep; being past the Castle, steer away for the *Needles*, which are sharp white Rocks; giving a Birth to some Rocks that lie off from the Island Side in the Fairway, between the Castle and the *Needles*, you must keep close to the *Needles*. The Tide of Ebb setteth on the *Shingles*, which are hard Stones. The Flood setteth on the *Needles*.

To sail into the *Needles*, you will know the going in by the high white Land which is the West-end of the *Isle of Wight*; run boldly in with the Land, till you see the *Needle Rocks*, and then keep close to them, observing the Tides, as in the Directions coming out. *Note*, That there is a strong Indraught that sets in at the *Needles*, and into *Pool*; which Indraught hath haul'd many Ships into *Freshwater-Bay*. Keep in 25 and 30 Fathom, and you need not fear the Indraught of the *Wight*.

To sail within the Wight in thick Weather.

To sail between the Main and the *Wight* in thick Weather borrow in 6 fathom off *St. Hellen's* and steer NW. by N. and N.N.W. from *St. Hellen's Point*.

Point, till you have 12 Fathom, and then steer more Westerly, as you find the Depth; come no nearer *No Man's Land* than 9 or 10 fathom; in that Depth you may keep along the *Wight* Side, if the Wind be Southerly; but if it be large, keep in 14 or 15 Fathom, which is a good Birth from both sides, and so steer W by S. and W. S. W. as you find the Depth until you come to *Cows*. Note, That being about *Stoke's-bay*, there will be less Water; if you go nearer to *Cows*, there you may anchor in 12 or 14 Fathom, in the midst of the Channel, where is good lowiey Ground.

Directions for Dover Road.

The best Ground in *Dover Road* is with the *Whiteway*, to the NW. of *Dover Castle*, or between that Hill that comes from *St. James's Church*, which is a flat Steeple at the North end of *Dover Town*, for a thwart Mark, and so in what Depth you please, from 12 to 14 fathom. Thwart of *Foulkstone* in 12 or 14 Fathom is very good Ground.

Directions to sail into the North-Foreland through the Gulls in the Night.

If your ground Tackle should fail in the Night riding at the *North-Foreland*, as very often hath happened, and you cannot weather the *Foreland*, weather the *Northsand-head*; if you can but see the *North Foreland* Light, when that Light-house bears N W. or N W by N. then bear over into 8 or 9 Fathom, and being in that Depth (steering SSW.) you may be sure it will carry you directly through with the *Brake*, by keeping your Lead carefully, borrowing no nearer the *Brake* than five Fathom, nor going without nine Fathom, or nine and a half, as you have the Tide under you; this Course will lead you through without Danger.

Directions for the North-end of the Goodwin, for such as sail from the North-Foreland to the Southward in the Night.

If you be at the *North-Foreland*, bound for the *Downs*, and that the Tides do fall out too early or too late; to turn into the *Downs* with the Wind at SW. or WSW. take the following Directions.

If it be in the Morning before Day, then be sure to weigh Anchor in convenient Time, to be at the *Northsand-head* at the turning of the Tide, to the Southward. From the *Foreland* you may steer out with a Flood Tide, S.E. by E. and S.E. or keep the Light of the *North-Foreland* N. W. by N. this Course will lead you out. But for the more Certainty, be sure keep the Lead well, and then you may borrow off and on with the aforesaid Winds, in 7 or 8 Fathom, and steering out with the fore said Course, you shall find the Depth suddenly change to 15 or 20 Fathom; then

then you may hale up close to the Southward, along the Back of the *Goodwin*, the Eastermost-side of which lies S. S. W. and N. N. E. 12 or 14 Fathom, and is not above a Saker-shot from the Sand. But if it be in the Day Time, and the Wind blows so hard that you cannot well tack to run through the *Gulls*, then the Marks to carry you out at the *Northsand-head*, is the flat Church upon the *Foreland* called *St. Peter's*, a Ship's Length to the Northward of *Broad-stairs* Pier-head; or borrow upon the Sand by the Lead as aforesaid, and so taking the first of the Tide without the Sand, you may stand to the South Eastward, till the *South-Foreland* bears W by S. then cast about, and you shall weather the *Southsand-head*, and be in the *Downs-Road* as soon as any other Ship that parted with you at the *Foreland*.

Directions for sailing over the Spits, the Wallet, and by the Naze into Harwich.

Sailing down the *Swin* or *King's Channel*, and that you would sail into *Harwich* over the Buoy of the *Spits* into the *Wallet*, you must observe your Tides, for at the *Spits* the Buoy lieth in 5, 6, and 7 Foot Water at low Water, and the Passage often alters, sometimes more Water, sometimes less. The Buoy lieth on the West-end of the *Gunfleet* Sand, and the East-end of the *Buxey*, being from a flat Steeple, called *Great Holland Church*, South by East. Being over the *Spits*, you come into the *Wallet*, where is very good Anchoring in five, six, seven and eight fathom Water; the Sands lying without, makes it a most excellent Road. There is a good and deep Channel to sail in at the *Wallet* between the *Gunfleet* and the *West Rock*, but 'tis seldom used. Being over the *Spits*, in the *Wallet*, steer away for the *Naze*, which may be known by the Trees, and a House that standeth on it, keep about half a Mile, or a Mile off from the *Naze*, to avoid the Stone Bank which hath but 5 Foot Water on it at low Water; and lieth from the *Naze* Trees E by N. About a Mile and an half from the *Naze* Point, there is about 8 or 9 Foot Water between it and the *Naze* at low Water: Keep *Payn's* Trees that lie a little to the Southward of *Harwich*, open and shut with *Harwich-Cliff*, and this Mark will carry you on the Stone Bank, and the Trees on the *Corkland*, just open of the *Nazeland*, will carry you on the Bank also. There is a good leading Mark to carry you between the *Naze* and the Stone Bank, which is *Harwich* Steeple, on *Harwich* Beacon Cliff, which will also carry you between the *Pyefand*, and the Ridge into the *Rowling Ground*, where Ships anchor in 3 and 4 Fathom at low Water. The Mark to anchor in the best of the *Rowling-ground*, is to bring *Harwich* Windmill two Sails breadth open of *Harwich* Cliff: And to sail from the *Rowling-ground* to the *Naze* keep *Payn's* Trees open of *Harwich-Cliff*, till you bring the

Naze

Naze to bear S. W. then keep *Harwich* Steeple, on the Beacon Cliff, to run within the Stone Bank. There is a Channel to sail from the *Naze* between the Cork Sand and the Ridge, keeping the *Naze* Trees S. W. sailing down N. E. between the Cork and the Ridge, in 5, 6, and 7 Fath. Water. And when you have brought *Harwich* Steeple on the Brew-house that lieth to the Northward of *Languard* Fort, then are you clear of the Cork Ledge; this Channel is much used by the Light Colliers going to the Northward.

Being in the *Rowling* Grounds, and that you would sail into *Harwich* Harbour keep close by the *Andrews*, which is a Sand that lieth off from *Languard-Fort*, and is steep too on the West-side; The Tide of Ebb runneth strong over the *Andrews* the first half Ebb, of which you must have a Care. This Sand is dry at low Water; keep close by the Beach of *Languard Fort*, to avoid the *Altar*, which is a small stony Shelf that lieth right West from *Languard-Fort*, about a Cable and an half's Length from the Beach at the Fort, on which is but 5 and 6 Foot at low Water. You may sail to the Westward of it, between it and *Harwich-Cliff*, according as the Tide is up, and what Draught of Water your Ship draweth: But if you should want to go into *Harwich* at low Water, and your Ship draweth above 15 Foot, you must stay for the Flood to have Water over the *Glutton*, which is a narrow Ridge that stretcheth off from the Beach thwart the Channel, a little within the Brewhouse, that is to the Northward of *Landguard Fort*: Being past the *Glutton*, you must keep close to the Beach, to avoid the Gristle, that lieth in the middle between *Harwich* and the Beach of *Languard Fort*, on which is but three Foot at low Water, there is a small Channel between the Gristle and the Guard, of 9 Foot at low Water, but when you have opened *Dover* Court Church off *Harwich* Town, then are you clear of the Gristle and the Guard, and may anchor before the Town of *Harwich*, in 5 Fathom Water, or run into *Ipswich* Water, and anchor; this is a very safe Harbour, and if a Ship should chance to blow a-shore she cannot take harm, the Shore being soft owse. The Spring-Tides rise 15 and 16 Foot, and the Neap-Tides 10 and 11 Foot.

Directions to sail into Harwich through the Sled-way.

Being at the Buoy of the *Spits*, and you are not minded to sail over the *Spits*, then keep down by the *Gunfleet Sand*, in 7 and 8 Fath. Water, till you come within two Miles of the Buoy of the *Gunfleet*, and then come no nearer than 9 Fathom Water, for there lieth off a *Spit*, E. S. E. from the Sand about a Cable's Length; to the Eastward of this *Spit* is a small Swatch through the Sand, into which, and *Goldmore's Gat*, the Tide of Flood setteth strong into the *Wallet*; of which you must have a
Care

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Care when you come near it, especially in little Winds or Calms, you may be haled on the *Gunfleet*; this Sand lieth N. E. and S. W. and drieth in several Places: The Buoy of the *Gunfleet* beareth from the *Naze* S. E. by E. Easterly: you may stand into 7 or 8 Fathom along the side of the W. Rock into the *Sledway*, keeping *Balsfey Church* N. by W. and N. N. W. till you bring *Harwich Steeple* on the Brewhouse (that lieth to the Northward of *Languard Fort*) which will carry you clear of the *Cork Ledge*, on which is two Fathom and an half at low Water, and then stand to the Westward, and keep *Orford Church* and *Castle* open off *Balsfey Church* a Sail's Breadth, till you have the Lights together, keep them so till you are past the *Andrews*, and then follow the former Directions for sailing into *Harwich*: you may stand in upon the *Platters* into five Fathom, on which Sand is but 2 and 3 Foot at low Water; the Ridge hath 7 Foot at low Water; a great part of the *Cork Sand* drieth at low Water; and lieth in Length N. E. and S. W. about two Miles and an half long, and a Mile broad; West Rocks lie in Length N. E. and S. W. about 3 Miles, and 2 Miles broad, and drieth in several Places, full of Banks and Swatches, the Ground rocky and stony in many Places; there is a small narrow Channel between the West Rocks and the *Cork*.

For the more particular Directions for Sailing into these and other Harbours in *England, Scotland, Holland, Normandy, Bretagne, &c.* see the last Edition of the *Coasting Pilot*, newly Corrected and Reprinted for Messieurs *Mount and Page* on *Tower-Hill, London*, with many Additions.



F I N I S.



